IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 18, Issue 8 Ser. 7 (August. 2019), PP 67-90
www.iosrjournals.org

Perioral soft tissue evaluation of skeletal Class II Division I malocclusion in Himachali population: A lateral cephalometric study

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Abstract: ***Aim:*** *To evaluate the perioral soft tissue characteristics of skeletal Class II Division 1 subjects (group II) with various vertical patterns compared with skeletal Class I subjects (group I).in himachali population.* ***Material and Methods:*** *Lateral cephalograms of 100 adults (60 women, 40 men; age range 18-50yrs) were divided into 4 groups based on horizontal and vertical skeletal pattern (SN-MP angle): group I, 25 subjects; group II-low angle (<27°), 25 subjects; group II-normal angle (27°-36°), 25 subjects; and group II-high angle (>37°), 25subjects. The correlations and multiple linear regression tests were used to determine the skeletal and dental variables influencing soft tissue characteristics.* ***Results****: Group II-high angle showed significantly greater values than did group II-low angle for basic lower lip thickness and lower lip length. The perioral soft tissue measurements of group II were correlated with the inclination and anteroposterior position of the maxillary and mandibular incisors along with facial depth (N-Go) and facial length (S-Gn). Upper lip strain of group II was not influenced by any skeletal variables but only by the inclination and anteroposterior position of the maxillary incisors.* ***Conclusions****: It is important to evaluate lip strain and lip thickness based on the skeletal pattern as well as dental inclination to obtain balance in the perioral muscle activity.*
Keywords: *Perioral soft tissue, Class II division 1 malocclusion, cephalometry*

Date of Submission: 03-08-2019 Date of acceptance: 19-08-2019

I. Introduction

The important goal in orthodontics is to maintain facial harmony along with occlusal excellence. Consideration of both hard and soft tissues during orthodontic treatment planning results in successful treatment like subjective patient desire and objective treatment goals.[1] Therefore to determine the facial appearance by soft tissue analysis as well as underlying skeletal pattern in orthodontic treatment planning is necessary.[2]

Riedel stated that various points which make up the hard tissue profile outline bear harmonious relationship to each other in patients presenting good profile.[3] It was found that lip posture was closely correlated with the posture of underlying dental and alveolar structures so an orthodontist can modify the position of teeth and alveolar structures to improve facial esthetics.[4] Most of the studies that evaluated the soft tissue thicknesses have been carried out with subjects with normal skeletal patterns, and a few studies have investigated the soft tissue thickness of patients with different skeletal classifications. Soft tissue profiles can be

influenced not only by skeletal pattern but also by dental position, and this is the focus with the characteristics of skeletal Class II Division1 in this study.

Utsuno et al investigated the soft tissue thickness of patients with different skeletal classifications in Japanese girls and women and reported differences among them in mean facial soft tissue thicknesses, and the greatest differences were found between skeletal Class II and Class III, with Class I being intermediate. In the study of Kim at al soft tissue characteristics of skeletal Class II were evaluated and showed significant differences in the length of the soft tissues between skeletal Class I and Class II patients. However, this study did not divide the skeletal Class II subjects into Division 1 and Division 2 groups.

These studies had limitations because many factors like age, sex, ethnic and racial aspects, critical nature of observer affected facial profile assessment. Sexual dimorphism, relative position and growth potential of the soft tissues of the nose, lips, and chin should be evaluated before any assessment of teeth and skeletal structures. Therefore, more objective soft tissue cephalometric guidelines providing reference values of overlying soft tissue thicknesses for each ethnic group would be requisite for enhanced treatment planning.

Also vertical growth pattern have different effect on different facial types and is changed by growth and by orthodontic treatment. This information is properly used to erase many of the adverse changes that are happening every day. We evaluated the perioral soft tissue characteristics of skeletal Class II Division 1 patients with different vertical patterns. The aims of this study were to determine the characteristics of perioral soft tissues in Himachali adults with skeletal Class II Division 1 malocclusions according to vertical Growth patterns compared with subjects with normal occlusion in skeletal Class I and to evaluate correlation of skeletal and dental variables affecting soft tissue thickness using cephalometric analysis.

II. Material And Methods

This study was conducted in the department of Orthodontics and Dentofacial Orthopaedics. The 120 subjects were divided into two groups .

GROUP I : Skeletal class I(control group)

GROUP II : Skeletal class II division I malocclusion. The GROUP II is further divided into three subgroups according to vertical pattern based on Sella- Nasion to Mandibular plane angle.

GROUP IIa:- low Mandibular plane angle (SN – MP < 27)

GROUP IIb : average Mandibular plane angle (SN- MP

GROUP IIc : high Mandibular plane angle

The inclusion criteria for GROUP I were as follows:-

1.Skeletal class I malocclusion with class I molar and class I canine relation

2.Normal overjet and normal overbite

3. No missing teeth except third molar

4.Absence of crowding

5.No alteration of facial morphology

The inclusion criteria for GROUP II were as follows:-

1.Skeletal class II malocclusion (ANB > 4, Wits appraisal > 0 and maxillary central incisor to Sella-Nasion ,> 95)

2. Class II molar and class II canine relation

3. Mild crowding (arch length discrepancy <4 mm)

Lateral cephalograms were taken in natural head position and the patients were guided to close the lips in rest position. Lateral cephalograms were traced on acetate sheet. The following dental, skeletal and soft tissue measurements were done in different type of groups as shown in **Table 1, Table 2 and Table 3.**

Table 1 showing dental measurements done on different types of malocclusion groups.

UI to SN(°)	The angle formed by Sella-Nasion and the incisor long axis
UI to NA(°)	The angle formed between the long axis of the maxillary incisor to nasion – A point lines.

UI to NA(mm)	The linear distance from the most labial surface of incisor to the Nasion – A point line
LI to NB(°)	The angle formed between the long axis of the mandibular incisor to nasion – B point line.
LI to NB(mm)	The linear distance from the most labial surface of incisor to the Nasion – B point line
IMPA	The inner angle between the long axis of the mandibular incisor and mandibular plane
Overjet(mm)	The projection of the upper anterior teeth over their antagonists in a horizontal direction when the mandible is in central relation.
Overbite(mm)	The projection of the upper anterior teeth over the lower teeth in a vertical direction when posterior teeth are in central occlusion.

Table 2 showing skeletal measurements done on different types of malocclusion groups.

SN to MP (°)	The angle formed between the anterior cranial base (S-N) to mandibular plane. (drawn between gonion(Go) and gnathion(Gn)).
FMA (°)	The angle formed between Frankfort horizontal plane and the line drawn along the lower border of mandible through constructed gonion and menton
SNA (°)	The angle between Sella-Nasion and Nasion—A point
SNB (°)	The angle formed between the Sella-Nasion and Nasion–B point Planes
ANB (°)	The difference between the SNA and SNB angles
Wits (mm)	The perpendicular lines from points A and B on to the occlusal plane. The points of contact are labeled AO and BO, respectively.
Facial length (mm)	Measured from Sella to Gnathion
Facial depth (mm)	Measured from Nasion to Gonion
Facial height ratio (%)	Ratio of Sella-Gonion to nasion-menton(S-Go/N-Me)

Table 3 showing soft tissue measurements done on different types of malocclusion groups.

Basic upper lip thickness (mm)	linear distance from 3 mm below A-point to subnasale
Upper lip thickness (mm)	Linear distance from the most prominent labial point of the maxillary incisor (U1) to labrale superius (Ls)
Upper lip strain (mm)	the difference between basic upper lip thickness and upper lip thickness
Lower lip thickness (mm)	linear distance from the most prominent labial point of the mandibular incisor (L1) to labrale inferius (Li)
Basic lower lip thickness (mm)	linear distance from B-point to the deepest point of the labiomental fold
Chin thickness-H (mm)	linear distance from pogonion to its sagittal projection on the soft tissue (Pog-Pog′)
Chin thickness-V (mm)	linear distance from menton to its vertical projection on the soft tissue (Me-Me′)

Subnasale to H-line (mm)	Linear distance from subnasale to H-line
Lower lip to H-line (mm)	Linear distance from lower lip to H-line
Ricketts' E-line-upper (mm)	Linear distance from vermilion border of upper lip to the E line
Ricketts' E-line-lower (mm)	Linear distance from vermilion border of lower lip to the E line
Upper lip length (mm)	vertical distance from subnasale to the lowest point of the upper lip (Stms) perpendicular to the Frankfort horizontal plane (FH plane)
Lower lip length (mm)	vertical distance from the highest point of the lower lip (Stmi) to the soft tissue B-point perpendicular to the FH plane
Soft tissue contour (mm)	total length of lower facial profile (subnasale-Me′)
Hard tissue contour (mm)	total length of hard tissue contour (anterior nasal spine-Me)
Contour ratio (%)	Percentage ratio of soft tissue contour to hard tissue contour;
Nasolabial angle (°)	The angle formed by the intersection of the lines tangent to the columella of the nose and the upper lip
H-angle (°)	angle formed by H-line and soft tissue nasion-Pog0 line.

III. Statistical Analysis

SPSS version 15 computer program was used for the statistical analysis of the data. The statistical analyses included:

1. Descriptive Statistics: Mean, standard deviation (SD), minimum, and maximum values.
2. Inferential Statistics

- 1-way analysis of variance: comparison among groups
- Post hoc Scheff'e test: to analyze differences between the groups.
- Independent samples t-test: For comparison between both genders.
- Pearson's correlation coefficient test and multiple linear regression test: To find out the variable affecting soft tissue.

IV. Results

Table I Facial length (sella-gnathion) showed a significantly greater value in group I than in groups II-N and II-H. Facial depth (nasion-gonion) had a lower value in group II-H than in groups II-L and II-N. The values for L1 to NB (in millimeters and degrees) were statistically lower in group I than in groups II-N and II-H. Also, the values for L1 to NB (in millimeters and degrees) were significantly lower in group II-L than in groups II-N and II-H.

Table II, For the soft tissue analysis of all subjects, lower lip thickness was significantly increased in group II-L compared with groupI. Basic lower lip thickness had significantly greater value in group II-H than in group II-L. Lower lip length was significantly greater for groups II-N and II-H compared with group II-L. Also, there were statistical differences between groups II-L and II-H in soft tissue contours, hard tissue contours, and contour ratios.

In **Table III**, Most measurements of soft tissue thickness at both the vertical and sagittal planes were greater in the men than in the women in all experimental groups. The values for basic upper lip thickness and upper lip thickness were significantly greater in men than in women in all groups (P\0.05).

In **Table IV**, The thickness of the perioral soft tissue was correlated with facial depth and facial length except for upper lip length. Also, basic lower lip thickness and lower lip length were correlated with SN-MP and FMA. Basic upper lip thickness and upper lip thickness showed negative correlations with L1 to NB (degrees) with the highest coefficients. Upper lip strain showed correlations only with dental values, such as U1 to NA

(millimeters and degrees), U1 to SN (degrees), and overjet. Basic upper lip thickness and basic lower lip thickness were correlated positively with most of the dental variables including L1 to NB (millimeters and degrees) and U1to NA (millimeters and degrees).

In **Table V,** With the adjusted R2 values between 0.08 and 0.52, soft tissue thickness (ie, basic upper lip thickness, upper lip thickness, lower lip thickness, and basic lower lip thickness) was generally influenced by L1 to NB (millimeters and degrees). Upper lip strain was associated with U1 to NA (millimeters). Also, upper lip length and lower lip length were influenced by maxillary incisor exposure and L1 to NB (millimeters), respectively. Basic upper lip thickness, basic lower lip thickness, and lower lip length were influenced by facial length.

V. Discussion

Soft tissue analysis is important in making orthodontic treatment planning and this can be achieved by knowing the effect of soft tissue in different skeletal classification. As the prevalence of Class II Division 1 malocclusion is high so in this study the soft tissue measurement of Class II Division 1 is considered for orthodontic treatment planning[28].

Previous studies have shown that the inclination of Mandibular plane affect the position of chin. Schudy and Isaacson et al concluded in a study that Mandibular plane (SN-MP) has an effect on mandibular rotation as larger the SN-MP angle, the mandible tend to become more steeper and more the chin moves backward, and vice versa[29-31]. Therefore, we found that the soft tissue measurements vary in same skeletal class with different vertical pattern.

In this study, most measurements of perioral soft tissue thickness were greater in men than in women. The basic upper lip thickness was significantly greater in men than in women in all groups. Kim KH et al and Sung et al found the same results of soft tissue measurement for both sexes[20,32]. Kamak H et al studied on Turkish population and concluded that lower lip thickness was greater in Class II skeletal pattern[15]. Lee et al studied on Korean population and found that lower lip thickness was significantly greater in Class II Division 1 malocclusion with low and high Mandibular plane angle (SN-MP) compared with Class I skeletal malocclusion. In our study also lower lip thickness was significantly greater in group II-L compared with group I[20, 33]. In our study we found no significant difference in upper lip length between groups I and II. This is in correlation with the study done by Lee et al in Korean population.

In study done by Lee et al on Turkish population, they found that basic lower lip thickness was significantly greater in class II Division 1 with high SN-MP angle compared between Class II division 1 with low and normal SN-MP angle and Class I malooclusion[21]. Our study found similar results in which also basic lower lip length was significantly higher in group II-H than in group II-L (14.88±1.45 for group II-H and 12.62±0.94 for group II-L). This is due due to the compensation of the soft tissue for the high SN-MP skeletal pattern. Blanchette et al stated that this may have been a natural phenomenon that compensates for the shorter Mandibular corpus length in order to mask the condition and providing a more normal facial appearance. Conversely the short vertical pattern showed a smaller basic lower lip thickness as a result of deficiency of vertical skeletal growth[21]. In our study lower lip length was statistically greater in group II-H than in group II-L (18.81±1.09 and 16.88±0.82 for group II-H and group II-L respectively). This is in concordance with study by Lee et al that found similar result.

According to Holdaway[3], upper lip strain is difference between basic upper lip thickness and upper lip thickness and was useful in determining the amount of lip strain or incompetency. Holdaway suggested that the upper lip strain of 1mm or less would be acceptable and excess of it result in thinning of upper lip as it is stretched over the protrusive teeth. Therefore, we can achieve acceptable upper lip strain by controlling the incisors to eliminate the lip strain. By correlating results of group II statistically correlation was seen in upper lip strain with UI/NA (degree and mm) and UI/SN (degree). The upper lip strain observed in range (2.0±1.4, 3.1±0.9, 2.9±0.9, 1.9±0.9 mm for groups I, II-L, II-N, and II-H, respectively)

in our study groups which was influenced by proclination and saggital position of upper incisors rather than by the vertical and horizontal skeletal pattern. Thus, presumption of soft tissue change rather be based on dental characteristics of upper incisors instead of vertical pattern of mandible.

In this study we found that the value for L1 to NB (degrees) had a statistically greater value compared with group II-H. LI to NB (degrees) found to be positively correlated with SN-MP and this might be because of the compensating effort. Chung et al found greater values for L1 to NB (degrees) for the high angle groups which showed the same tendency as in our study. Therefore, the greater value of the L1 to NB (degrees) that is compatible with the high SN-MP vertical pattern might have induced thinning of the upper lip, showing negative correlations (Table V). Thus, lip strain needs to be evaluated carefully depending on the sagittal position of the mandibular incisors because an increased value of U1 to NA (degrees) can affect upper lip strain in Class II patients.

We correlated upper lip thickness and basic lower lip thickness with dental variables which include L1 to NB (degrees and millimeters) and U1 to NA (degrees and millimeters). As reported by Angle[36] upper lip thickness and basic lower lip thickness were influenced by the position and angulation of maxillary incisors because the lower lip covers the incisal third of maxillary incisors as explained by Subtelny[37]. In our study we measured skeletal variables which include facial depth and facial length which then correlated with saggital and vertical measurement of perioral soft tissues. Facial depth and facial length develop similarly as of the face and dentition. In our study both vertical and saggital measurements of perioral soft tissue thickness were positively correlated with the facial length and facial depth.

In multiple linear regression analysis, the independent variables used in each regression model test were selected according to the results of the correlations tests. Basic upper lip thickness, upper lip thickness, and lower lip thickness were influenced by L1 to NB (degrees and millimeters). Upper lip strain was associated with U1 to NA (millimeters). The skeletal independent variable influencing the measurements of perioral soft tissue thickness was facial length. The adjusted R2 value, observed between 0.077 and 0.523, shows that much is unexplained about perioral soft tissue measurements, which also could be influenced by features unlikely to be related to orthodontic diagnosis and treatment.

In our study the sample comprises of male and female group was too small to calculate the statistical power separately. Therefore, larger sample and additional skeletal classification (eg, Class II Division 2 or Class III) in comparative studies should be done to increase the scientific and statistical power. The pre and post orthodontic treatment changes of perioral soft tissues should be considered as well.

Several studies have been done in different races to evaluate the soft tissue thickness[39] and found variation among races for example soft tissue thickness variation among African Americans and white Americans, Saudi Arabians and white people[40, 41]. Therefore, the thickness characteristic of this study is limited to Himachali population, and future research should consider racial differences when validating our results. We found certain limitation in investigating the soft tissue because of the reliability of obtaining a relaxed lip profile radiographically. Even though the radiographs were taken with the lips closed for adequate lip thickness and lip strain conditions, a strained lip position could occur because of muscle hyperactivity from chin prominence. As posteroanterior radiographs or frontal facial photographs were not available so we did not include transverse measurements as it may affect soft tissue thickness. Within the limitations of this study, it can be concluded that perioral soft tissue characteristics of skeletal Class II Division 1 subjects showed significant differences according to sagittal and vertical skeletal patterns and were influenced by anteroposterior positions and the inclination of the incisors along with facial depth and facial length. Therefore, clinicians should evaluate lip strain and lip thickness based on the skeletal pattern as well as the dental inclination to establish the treatment objectives for a balanced facial profile.

VI. Conclusions

1. The basic lower lip thickness and lower lip length had significantly greater values in Class II Division 1 malocclusion with high Mandibular plane angle than in subjects with low Mandibular plane angle.
2. The measurements of perioral soft tissue thickness were correlated with the inclination and the anteroposterior position of the upper and lower incisors along with facial depth and facial length in skeletal Class II subjects.
3. In the skeletal Class II subjects, upper lip strain was influenced by the inclination and the anteroposterior position of the maxillary incisors and was not influenced by any skeletal variables.

4. Clinicians need to evaluate lip strain and lip thickness based on the skeletal pattern as well as dental inclination to obtain balance in the perioral muscle activity.

Table I: Skeletal and dental measurements (means and standard deviations) for all subjects.

Descriptives									
					Std. Error	95% Confidence Interval for Mean			Maximum
		N	Mean	Std. Deviation		Lower Bound	Upper Bound	Minimum	
SN/MP	I	26	31.00	2.349	.461	30.05	31.95	28	35
	II L	26	24.92	.744	.146	24.62	25.22	24	26
	II N	26	31.08	1.017	.199	30.67	31.49	30	32
	II H	26	41.38	1.388	.272	40.82	41.95	40	44
	Total	104	32.10	6.126	.601	30.90	33.29	24	44
FMA	I	26	26.88	1.177	.231	26.41	27.36	25	29
	II L	26	20.19	1.443	.283	19.61	20.78	16	22
	II N	26	25.92	1.671	.328	25.25	26.60	21	28
	II H	26	32.15	2.327	.456	31.21	33.09	29	39
	Total	104	26.29	4.585	.450	25.40	27.18	16	39
SNA	I	26	82.27	1.888	.370	81.51	83.03	79	85
	II L	26	82.00	2.191	.430	81.12	82.88	79	85
	II N	26	81.81	2.281	.447	80.89	82.73	79	85
	II H	26	81.54	2.533	.497	80.52	82.56	78	85
	Total	104	81.90	2.219	.218	81.47	82.34	78	85
SNB	I	26	80.12	1.505	.295	79.51	80.72	77	82
	II L	26	79.00	.000	.000	79.00	79.00	79	79
	II N	26	76.65	2.497	.490	75.65	77.66	73	80
	II H	26	76.15	2.378	.466	75.19	77.11	72	79
	Total	104	77.98	2.477	.243	77.50	78.46	72	82

ANB	I	26	2.15	.613	.120	1.91	2.40	1	3
	II L	26	5.77	1.070	.210	5.34	6.20	5	8
	II N	26	5.15	.368	.072	5.01	5.30	5	6
	II H	26	5.27	.452	.089	5.09	5.45	5	6
	Total	104	4.59	1.580	.155	4.28	4.89	1	8
WITTS	I	26	.92	.628	.123	.67	1.18	0	2
	II L	26	4.88	1.505	.295	4.28	5.49	2	7
	II N	26	3.96	.999	.196	3.56	4.37	2	5
	II H	26	3.00	.849	.166	2.66	3.34	2	5
	Total	104	3.19	1.801	.177	2.84	3.54	0	7
FC. LEN.	I	26	130.50	4.411	.865	128.72	132.28	124	138
	II L	26	122.77	2.303	.452	121.84	123.70	117	125
	II N	26	123.62	3.930	.771	122.03	125.20	117	129
	II H	26	122.81	2.743	.538	121.70	123.92	119	127
	Total	104	124.92	4.708	.462	124.01	125.84	117	138
FCDEP	I	26	121.23	4.264	.836	119.51	122.95	116	128
	II L	26	126.92	4.363	.856	125.16	128.69	118	132
	II N	26	121.46	2.818	.553	120.32	122.60	117	126
	II H	26	115.65	3.019	.592	114.43	116.87	109	120
	Total	104	121.32	5.405	.530	120.27	122.37	109	132
FHR(%)	I	26	64.9000	11.83734	2.32149	60.1188	69.6812	8.00	70.87
	II L	26	71.3358	1.66598	.32673	70.6629	72.0087	69.03	74.36
	II N	26	67.1977	1.79161	.35136	66.4740	67.9213	64.96	70.83
	II H	26	62.4050	.70315	.13790	62.1210	62.6890	60.94	63.78
	Total	104	66.4596	6.81810	.66857	65.1337	67.7856	8.00	74.36
UI/SN	I	26	104.35	1.129	.221	103.89	104.80	103	108
	II L	26	106.08	5.098	1.000	104.02	108.14	96	115
	II N	26	105.38	7.212	1.414	102.47	108.30	96	118

	II H	26	101.27	3.341	.655	99.92	102.62	97	110
	Total	104	104.27	5.036	.494	103.29	105.25	96	118
UI/NA	I	26	23.62	1.878	.368	22.86	24.37	20	26
	II L	26	25.58	4.751	.932	23.66	27.50	18	32
	II N	26	25.31	6.189	1.214	22.81	27.81	18	36
	II H	26	28.23	4.966	.974	26.22	30.24	20	38
	Total	104	25.68	4.937	.484	24.72	26.64	18	38
UI/NA mm	I	26	5.31	.736	.144	5.01	5.60	4	6
	II L	26	6.19	1.096	.215	5.75	6.64	4	8
	II N	26	6.88	1.143	.224	6.42	7.35	6	10
	II H	26	6.35	1.056	.207	5.92	6.77	5	8
	Total	104	6.18	1.156	.113	5.96	6.41	4	10
LI/NB	I	26	24.69	1.828	.358	23.95	25.43	22	29
	II L	26	28.42	2.610	.512	27.37	29.48	23	36
	II N	26	28.88	1.796	.352	28.16	29.61	26	31
	II H	26	29.19	1.980	.388	28.39	29.99	25	32
	Total	104	27.80	2.743	.269	27.26	28.33	22	36
LI/NB mm	I	26	5.19	.895	.176	4.83	5.55	4	7
	II L	26	6.54	1.104	.216	6.09	6.98	5	8
	II N	26	7.08	.744	.146	6.78	7.38	6	8
	II H	26	7.08	.845	.166	6.74	7.42	5	8
	Total	104	6.47	1.182	.116	6.24	6.70	4	8
IMPA	I	26	93.77	1.861	.365	93.02	94.52	91	97
	II L	26	100.46	4.264	.836	98.74	102.18	92	108
	II N	26	98.96	4.919	.965	96.97	100.95	92	106
	II H	26	97.42	3.361	.659	96.07	98.78	89	102
	Total	104	97.65	4.485	.440	96.78	98.53	89	108

Table II. Soft tissue analysis of all subjects (means and standard deviations).

Descriptives									
					Std. Error	95% Confidence Interval for Mean			Maximum
		N	Mean	Std. Deviation		Lower Bound	Upper Bound	Minimum	
BASIC UPPER LIP THICKNES	I	26	17.15	2.222	.436	16.26	18.05	15	21
	II L	26	16.85	.967	.190	16.46	17.24	15	18
	II N	26	14.96	.871	.171	14.61	15.31	14	17
	II H	26	13.81	1.234	.242	13.31	14.31	11	16
	Total	104	15.69	1.971	.193	15.31	16.08	11	21
UPPER LIP THICKNES	I	26	15.15	2.962	.581	13.96	16.35	12	20
	II L	26	13.81	1.443	.283	13.22	14.39	10	15
	II N	26	12.04	.344	.067	11.90	12.18	11	13
	II H	26	12.04	.999	.196	11.63	12.44	10	14
	Total	104	13.26	2.154	.211	12.84	13.68	10	20
UPPER LIP STRAIN	I	26	2.00	1.356	.266	1.45	2.55	0	5
	II L	26	3.04	.824	.162	2.71	3.37	2	5
	II N	26	2.92	.935	.183	2.55	3.30	2	6
	II H	26	1.85	.834	.164	1.51	2.18	0	3
	Total	104	2.45	1.131	.111	2.23	2.67	0	6
LOWER LIP THICKNES	I	26	16.42	2.533	.497	15.40	17.45	13	21
	II L	26	16.85	.925	.181	16.47	17.22	15	18
	II N	26	15.96	.824	.162	15.63	16.29	14	17
	II H	26	16.50	.860	.169	16.15	16.85	15	18
	Total	104	16.43	1.486	.146	16.14	16.72	13	21
BASIC	I	26	12.58	1.793	.352	11.85	13.30	10	15

LOWER LIP THICKNES	II L	26	12.62	.941	.185	12.24	13.00	11	14
	II N	26	13.65	1.573	.309	13.02	14.29	12	16
	II H	26	14.88	1.451	.285	14.30	15.47	10	17
	Total	104	13.43	1.734	.170	13.10	13.77	10	17
CHIN THICKNESS H	I	26	12.85	2.034	.399	12.02	13.67	8	16
	II L	26	13.15	1.434	.281	12.57	13.73	11	15
	II N	26	13.27	1.458	.286	12.68	13.86	10	15
	II H	26	13.00	1.166	.229	12.53	13.47	11	15
	Total	104	13.07	1.541	.151	12.77	13.37	8	16
CHIN THICKNES V	I	26	7.62	.898	.176	7.25	7.98	6	10
	II L	26	7.54	.508	.100	7.33	7.74	7	8
	II N	26	7.19	1.167	.229	6.72	7.66	5	9
	II H	26	7.54	1.029	.202	7.12	7.95	6	9
	Total	104	7.47	.934	.092	7.29	7.65	5	10
SUBSNAL H-LINE	I	26	5.42	1.629	.319	4.77	6.08	3	9
	II L	26	3.73	1.002	.197	3.33	4.14	2	5
	II N	26	6.38	.697	.137	6.10	6.67	5	7
	II H	26	6.54	.647	.127	6.28	6.80	5	8
	Total	104	5.52	1.539	.151	5.22	5.82	2	9
LOWER LIP H-LINE	I	26	-1.15	1.461	.287	-1.74	-.56	-4	2
	II L	26	-.92	2.038	.400	-1.75	-.10	-3	3
	II N	26	-.38	1.169	.229	-.86	.09	-3	1
	II H	26	-2.54	1.104	.216	-2.98	-2.09	-4	0
	Total	104	-1.25	1.671	.164	-1.57	-.93	-4	3
RIKKETS E-LINE UPPER	I	26	3.73	2.164	.424	2.86	4.60	0	8
	II L	26	5.08	1.853	.363	4.33	5.83	2	8
	II N	26	1.42	2.928	.574	.24	2.61	-3	4
	II H	26	2.31	1.934	.379	1.53	3.09	-2	4

	Total	104	3.13	2.629	.258	2.62	3.65	-3	8
RIKKETS E-LINE LOWER	I	26	1.04	1.800	.353	.31	1.77	-3	5
	II L	26	1.15	1.488	.292	.55	1.76	-1	4
	II N	26	.58	.758	.149	.27	.88	0	2
	II H	26	1.62	1.359	.266	1.07	2.16	0	4
	Total	104	1.10	1.431	.140	.82	1.37	-3	5
UPPER LIP LENGTH	I	26	20.92	1.573	.308	20.29	21.56	17	23
	II L	26	19.69	1.490	.292	19.09	20.29	17	21
	II N	26	22.00	.800	.157	21.68	22.32	21	24
	II H	26	21.35	1.198	.235	20.86	21.83	19	23
	Total	104	20.99	1.536	.151	20.69	21.29	17	24
LOWER LIP LENGTH	I	26	18.65	1.231	.241	18.16	19.15	17	21
	II L	26	16.88	.816	.160	16.55	17.21	16	19
	II N	26	17.77	.908	.178	17.40	18.14	16	19
	II H	26	18.81	1.096	.215	18.36	19.25	17	21
	Total	104	18.03	1.273	.125	17.78	18.28	16	21
SOFT TISSUE CONTOUR	I	26	74.42	2.996	.587	73.21	75.63	68	79
	II L	26	71.19	2.654	.520	70.12	72.26	67	75
	II N	26	75.92	1.164	.228	75.45	76.39	75	78
	II H	26	78.08	1.719	.337	77.38	78.77	75	81
	Total	104	74.90	3.357	.329	74.25	75.56	67	81
HARD TISSUE CONTOUR	I	26	70.35	3.463	.679	68.95	71.75	66	76
	II L	26	65.08	3.249	.637	63.76	66.39	60	70
	II N	26	69.15	2.185	.429	68.27	70.04	66	73
	II H	26	75.62	1.722	.338	74.92	76.31	72	79
	Total	104	70.05	4.652	.456	69.14	70.95	60	79
NASOBIAL ANGLE	I	26	106.42	7.256	1.423	103.49	109.35	95	120
	II L	26	107.81	9.108	1.786	104.13	111.49	96	122

	II N	26	102.35	7.652	1.501	99.26	105.44	95	122
	II H	26	107.42	7.420	1.455	104.43	110.42	94	117
	Total	104	106.00	8.077	.792	104.43	107.57	94	122
H-ANGLE	I	26	16.31	4.389	.861	14.54	18.08	10	24
	II L	26	18.15	2.962	.581	16.96	19.35	15	24
	II N	26	17.88	2.104	.413	17.03	18.73	16	24
	II H	26	18.00	1.549	.304	17.37	18.63	15	22
	Total	104	17.59	3.004	.295	17.00	18.17	10	24
CONTOR RATIO (%)	I	26	1.0588E2	3.18178	.62400	104.5945	107.1648	98.55	112.12
	II L	26	1.0947E2	1.91791	.37613	108.6956	110.2449	107.14	114.06
	II N	26	1.0985E2	2.02211	.39657	109.0295	110.6630	106.85	113.64
	II H	26	1.0327E2	1.37094	.26886	102.7118	103.8192	101.33	108.33
	Total	104	1.0712E2	3.49397	.34261	106.4359	107.7949	98.55	114.06

Table III. Soft tissue analysis between the sexes for each experimental group (means and standard deviations). Group II-L

Group Statistics						
	GENDER	N	Mean	Std. Deviation	Std. Error Mean	P vahue
BASIC UPPER LIP THICKNES	MALE	8	18.00	.000	.000	.000
	FEMALE	18	16.33	.686	.162	.000
UPPER LIP THICKNES	MALE	8	15.00	.000	.000	.003
	FEMALE	18	13.28	1.447	.341	.000
UPPER LIP STRAIN	MALE	8	3.00	.000	.000	.878
	FEMALE	18	3.06	.998	.235	.816
LOER LIP THICKNES	MALE	8	17.75	.707	.250	.000
	FEMALE	18	16.44	.705	.166	.001
BASIC LOWER LIP THICKNES	MALE	8	12.75	.707	.250	.637
	FEMALE	18	12.56	1.042	.246	.585
CHIN THICKNES H	MALE	8	11.38	.518	.183	.000

	FEMALE	18	13.94	.873	.206	.000
CHIN THICKNES V	MALE	8	7.25	.463	.164	.052
	FEMALE	18	7.67	.485	.114	.055
SUBSNAL H-LINE	MALE	8	4.88	.354	.125	.000
	FEMALE	18	3.22	.732	.173	.000
LOWER LIP H-LINE	MALE	8	-1.88	1.808	.639	.114
	FEMALE	18	-.50	2.036	.480	.106
RIKKETS E-LINE UPPER	MALE	8	2.88	1.356	.479	.000
	FEMALE	18	6.06	.998	.235	.000
RIKKETS E-LINE LOWER	MALE	8	-.25	1.389	.491	.000
	FEMALE	18	1.78	1.060	.250	.004
UPPER LIP LENGTH	MALE	8	19.75	1.035	.366	.898
	FEMALE	18	19.67	1.680	.396	.879
LOWER LIP LENGTH	MALE	8	16.88	.354	.125	.969
	FEMALE	18	16.89	.963	.227	.958
SOFT TISSUE CONTOUR	MALE	8	72.50	3.505	1.239	.094
	FEMALE	18	70.61	2.033	.479	.188
HARD TISSUE CONTOUR	MALE	8	67.00	4.243	1.500	.042
	FEMALE	18	64.22	2.365	.558	.117
NASOBIAL ANGLE	MALE	8	108.25	9.362	3.310	.873
	FEMALE	18	107.61	9.262	2.183	.874
H-ANGLE	MALE	8	18.88	.641	.227	.419
	FEMALE	18	17.83	3.519	.829	.240
CONTOR RATIO (%)	MALE	8	1.0830E2	1.73307	.61273	.036
	FEMALE	18	1.0999E2	1.80207	.42475	.040

Group II-N

Group Statistics						
	GENDER	N	Mean	Std. Deviation	Std. Error Mean	P value

BASIC UPPER LIP THICKNES	MALE	8	14.00	.000	.000	.000
	FEMALE	18	15.39	.698	.164	.000
UPPER LIP THICKNES	MALE	8	12.00	.000	.000	.712
	FEMALE	18	12.06	.416	.098	.579
UPPER LIP STRAIN	MALE	8	2.00	.000	.000	.000
	FEMALE	18	3.33	.840	.198	.000
LOER LIP THICKNES	MALE	8	15.75	.463	.164	.394
	FEMALE	18	16.06	.938	.221	.278
BASIC LOWER LIP THICKNES	MALE	8	12.25	.463	.164	.001
	FEMALE	18	14.28	1.487	.351	.000
CHIN THICKNES H	MALE	8	12.00	.000	.000	.001
	FEMALE	18	13.83	1.425	.336	.000
CHIN THICKNES V	MALE	8	8.00	1.069	.378	.015
	FEMALE	18	6.83	1.043	.246	.022
SUBSNAL H-LINE	MALE	8	6.75	.463	.164	.074
	FEMALE	18	6.22	.732	.173	.038
LOWER LIP H-LINE	MALE	8	.25	.463	.164	.063
	FEMALE	18	-.67	1.283	.302	.014
RIKKETS E-LINE UPPER	MALE	8	3.75	.463	.164	.004
	FEMALE	18	.39	2.973	.701	.000
RIKKETS E-LINE LOWER	MALE	8	1.25	.886	.313	.001
	FEMALE	18	.28	.461	.109	.017
UPPER LIP LENGTH	MALE	8	21.75	.886	.313	.297
	FEMALE	18	22.11	.758	.179	.337
LOWER LIP LENGTH	MALE	8	18.00	1.069	.378	.399
	FEMALE	18	17.67	.840	.198	.451
SOFT TISSUE CONTOUR	MALE	8	75.25	.463	.164	.047
	FEMALE	18	76.22	1.263	.298	.009

HARD TISSUE CONTOUR	MALE	8	68.25	1.165	.412	.164
	FEMALE	18	69.56	2.431	.573	.077
NASOBIAL ANGLE	MALE	8	100.88	3.907	1.381	.524
	FEMALE	18	103.00	8.852	2.086	.404
H-ANGLE	MALE	8	17.25	1.389	.491	.315
	FEMALE	18	18.17	2.333	.550	.227
CONTOR RATIO (%)	MALE	8	1.1027E2	1.27348	.45024	.482
	FEMALE	18	1.0966E2	2.28483	.53854	.387

Group II-H

Group Statistics						
	GENDER	N	Mean	Std. Deviation	Std. Error Mean	P value
BASIC UPPER LIP THICKNES	MALE	6	15.33	.516	.211	.000
	FEMALE	20	13.35	.988	.221	.000
UPPER LIP THICKNES	MALE	6	12.50	.548	.224	.203
	FEMALE	20	11.90	1.071	.240	.085
UPPER LIP STRAIN	MALE	6	2.83	.408	.167	.000
	FEMALE	20	1.55	.686	.153	.000
LOER LIP THICKNES	MALE	6	16.50	1.225	.500	1.000
	FEMALE	20	16.50	.761	.170	1.000
BASIC LOWER LIP THICKNES	MALE	6	14.67	1.211	.494	.684
	FEMALE	20	14.95	1.538	.344	.648
CHIN THICKNES H	MALE	6	13.67	1.033	.422	.112
	FEMALE	20	12.80	1.152	.258	.113
CHIN THICKNES V	MALE	6	7.50	.548	.224	.919
	FEMALE	20	7.55	1.146	.256	.885
SUBSNAL H-LINE	MALE	6	6.50	.548	.224	.872
	FEMALE	20	6.55	.686	.153	.857
LOWER LIP H-LINE	MALE	6	-2.17	1.602	.654	.357

	FEMALE	20	-2.65	.933	.209	.508
RIKKETS E-LINE UPPER	MALE	6	2.00	2.191	.894	.666
	FEMALE	20	2.40	1.903	.426	.698
RIKKETS E-LINE LOWER	MALE	6	1.83	.753	.307	.663
	FEMALE	20	1.55	1.504	.336	.542
UPPER LIP LENGTH	MALE	6	21.33	.816	.333	.977
	FEMALE	20	21.35	1.309	.293	.971
LOWER LIP LENGTH	MALE	6	19.67	1.033	.422	.025
	FEMALE	20	18.55	.999	.223	.047
SOFT TISSUE CONTOUR	MALE	6	77.50	1.643	.671	.359
	FEMALE	20	78.25	1.743	.390	.360
HARD TISSUE CONTOUR	MALE	6	75.00	1.265	.516	.328
	FEMALE	20	75.80	1.824	.408	.248
NASOBIAL ANGLE	MALE	6	110.83	3.312	1.352	.206
	FEMALE	20	106.40	8.049	1.800	.062
H-ANGLE	MALE	6	19.00	1.673	.683	.070
	FEMALE	20	17.70	1.418	.317	.126
	MALE	6	1.0333E2	.69953	.28558	.901
	FEMALE	20	1.0325E2	1.53056	.34224	.857

Table IV. Pearson correlation coefficients of group II between soft tissue thickness and skeletal and dental variables

		BASIC UPPER LIP THICKNES	UPPER LIP THICKNES	UPPER LIP STRAIN	LOER LIP THICKNES	BASIC LOWER LIP THICKNES	CHIN THICKNESH	CHIN THICKNES V	SUBSNAL H-LINE	LOWER LIP H-LINE	RIKKETS E-LINE UPPER	RIKKETS E-LINE LOWER	UPPER LIP LENGTH	LOWER LIP LENGTH	SOFT TISSUE CONTOUR	HARD TISSUE CONTOUR	NASOBIAL ANGLE	H-ANGLE	CONTOR RATIO (%)
SNMP	R	-.132	-.123	-.07	-.426*	-.358	-.096	.156	.521**	.362	.432*	.304	-.197	.193	-.401*	-.438*	-.029	-.014	.402*

				8															
	P	.520	.549	.706	.030	.073	.643	.448	.006	.069	.028	.132	.335	.344	.043	.025	.887	.944	.042
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
FMA	R	-.249	.005	-.234	-.089	-.284	.140	.233	.267	.312	.497**	.258	-.060	.041	-.188	-.347	-.123	-.014	.432*
	P	.219	.979	.249	.664	.159	.495	.251	.188	.121	.010	.204	.772	.844	.357	.082	.550	.946	.027
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
SNA	R	-.084	-.092	-.045	.102	-.387	-.056	-.316	.199	-.044	.210	-.142	.614**	-.582**	-.141	-.146	.384	.529**	.124
	P	.682	.654	.828	.619	.051	.786	.116	.329	.832	.302	.490	.001	.002	.491	.476	.052	.005	.547
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
SNB	R	-.080	-.077	-.046	.091	-.408*	-.083	-.278	.217	-.006	.289	-.081	.561**	-.548**	-.244	-.246	.413*	.479*	.208
	P	.698	.709	.823	.660	.038	.686	.169	.286	.976	.152	.696	.003	.004	.231	.225	.036	.013	.308
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
ANB	R	.019	-.049	.036	.020	.372	.218	-.072	-.240	-.229	-.657**	-.331	.000	.111	.776**	.765**	-.417*	.024	-.644**
	P	.926	.814	.862	.922	.061	.285	.728	.238	.261	.000	.098	1.000	.591	.000	.000	.034	.908	.000
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
WITTS	R	.090	.004	.082	-.002	.017	-.075	.453*	.022	.364	.607**	.453*	-.500**	.254	-.656**	-.712**	-.030	-.326	.659**
	P	.661	.983	.689	.993	.936	.716	.020	.915	.068	.001	.020	.009	.210	.000	.000	.886	.104	.000
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
FC.LE	R	-.156	-.018	-.13	-.326	-.242	-.261	-.29	.217	-.138	.105	-.003	-.280	.299	-.278	-.230	.192	-.533	.164

N.				9				7										**	
	P	.445	.930	.498	.104	.233	.199	.140	.288	.501	.609	.988	.166	.138	.169	.258	.347	.005	.422
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
FCDEP	R	-.009	-.102	.029	.180	.507**	-.119	.167	-.644**	-.090	-.364	-.036	-.177	.075	.365	.462*	-.394*	-.308	-.473*
	P	.966	.622	.887	.378	.008	.562	.416	.000	.663	.068	.861	.386	.717	.067	.017	.047	.126	.015
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
FHR(%)	R	-.009	-.126	.039	.097	.373	.041	.057	-.288	-.179	-.600**	-.235	-.034	.060	.670**	.725**	-.540**	.076	-.668**
	P	.967	.539	.852	.638	.061	.842	.783	.153	.382	.001	.248	.869	.770	.000	.000	.004	.711	.000
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
UI/SN	R	.410*	-.087	.414*	-.287	.185	.184	-.375	-.237	.312	.212	-.255	.541**	-.597**	-.230	-.314	.133	.359	.341
	P	.037	.673	.036	.155	.366	.369	.059	.243	.120	.299	.209	.004	.001	.259	.119	.517	.072	.088
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
UI/NA	R	.514**	-.081	.509**	-.343	.381	.057	-.363	-.334	.205	-.056	-.270	.307	-.357	-.147	-.125	.158	.172	.089
	P	.007	.694	.008	.086	.055	.782	.068	.095	.315	.786	.183	.127	.073	.475	.543	.440	.401	.667
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
UI/NAmm	R	.437*	-.293	.516**	-.557**	.177	.115	-.493*	.008	.085	-.164	-.336	.262	-.219	-.007	-.025	.018	.194	.042
	P	.025	.146	.007	.003	.387	.574	.011	.970	.679	.423	.093	.195	.282	.973	.905	.929	.343	.839
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
LI/NB	R	-.080	-.251	.018	-.301	.042	.196	.316	.069	.340	-.089	.227	.111	.032	.321	.280	-.428*	.229	-.204

	P	.699	.215	.929	.136	.839	.338	.115	.738	.089	.665	.264	.588	.876	.110	.166	.029	.260	.317
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
LI/NB mm	R	.128	-.324	.239	.005	.536**	-.020	.351	-.599**	.311	-.107	.131	.000	-.150	.238	.288	-.384	.057	-.289
	P	.533	.106	.240	.981	.005	.923	.079	.001	.122	.602	.524	1.000	.464	.242	.154	.053	.782	.152
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
IMPA	R	-.066	.143	-.114	-.208	.122	.141	.308	.133	.046	-.302	.167	-.386	.580**	.405*	.395*	-.503**	-.186	-.332
	P	.750	.487	.580	.309	.552	.492	.126	.518	.823	.134	.414	.051	.002	.040	.046	.009	.363	.097
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
INTERINCISAL	R	-.401*	-.219	-.293	.387	-.501**	.012	.188	.412*	-.246	.228	.188	-.076	.042	-.018	-.097	.149	.050	.154
	P	.042	.281	.146	.051	.009	.953	.357	.036	.226	.263	.358	.712	.839	.930	.639	.467	.808	.452
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26

Table V. Results of multiple linear regression of group II

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.654[a]	.428	.416	4.891

a. Predictors: (Constant), FC. LEN., LI/NB

Coefficients[a]				
Model	Unstandardized Coefficients	Standardized Coefficients	t	P value

		B	Std. Error	Beta		
1	(Constant)	97.107	20.670		4.698	.000
	LI/NB	-.968	.223	-.415	-4.337	.000
	FC. LEN.	.423	.130	.311	3.250	.002
a. Dependent Variable: BASIC UPPER LIP THICKNES						

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.299[a]	.089	.065	1.70880

a. Predictors: (Constant), UI/NA, LI/NB

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	P value
		B	Std. Error	Beta		
1	(Constant)	20.404	2.767		7.375	.000
	LI/NB	-.059	.099	-.069	-.594	.554
	UI/NA	-.089	.038	-.272	-2.360	.021
a. Dependent Variable: UPPER LIP THICKNES						

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.017[a]	.000	-.013	2.30481
a. Predictors: (Constant), UI/NA mm				

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	P value
		B	Std. Error	Beta		
1	(Constant)	-.897	1.833		-.489	.626

	LI/NB	.123	.063	.219	1.940	.056
a. Dependent Variable: LOER LIP THICKNES						

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.199[a]	.040	.014	1.64562
a. Predictors: (Constant), FC. LEN., LI/NB mm				

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	P value
		B	Std. Error	Beta		
1	(Constant)	5.350	8.967		.597	.553
	LI/NB mm	-.086	.225	-.048	-.384	.702
	FC. LEN.	.095	.067	.176	1.417	.161
a. Dependent Variable: BASIC LOWER LIP THICKNES						

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.007[a]	.000	-.027	1.64982
a. Predictors: (Constant), FC. LEN., LI/NB mm				

Coefficients [a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	P value
		B	Std. Error	Beta		
1	(Constant)	21.331	8.990		2.373	.020

	LI/NB mm	-.003	.225	-.002	-.012	.991
	FC. LEN.	-.004	.067	-.007	-.055	.956
a. Dependent Variable: LOWER LIP LENGTH						

References

[1]. **Burstone CJ**. Lip posture and its significance in treatment planning. Am J Orthod 1967;53:262-84.
[2]. **Bergman RT, Waschak J, Borzabadi-Farahani A, Murphy NC**. Longitudinal study of cephalometric soft tissue profile traits between the ages of 6 and 18 years. Angle Orthod 2014;84:48-55.
[3]. **Holdaway RA**. A soft-tissue cephalometric analysis and its use in orthodontic treatment planning. Part I. Am J Orthod 1983;84: 1-28.
[4]. **Holdaway RA**. A soft-tissue cephalometric analysis and its use in orthodontic treatment planning. Part II. Am J Orthod 1984;85:279-93.
[5]. **Riedel RA**. Esthetics and its relation to orthodontic therapy. Angle Orthod 1950;20:168-78.
[6]. September 2015 _ Vol 148 _ Issue 3 American Journal of Orthodontics and Dentofacial Orthopedics
[7]. **Riedel RA**. An analysis of dentofacial relationships. Am J Orthod1957;43:103-19.
[8]. **Burstone CJ**. The integumental profile. Am J Orthod 1958;44:1-25.
[9]. **Park YC, Burstone CJ**. Soft-tissue profile—fallacies of hard-tissue standards in treatment planning. Am J Orthod Dentofacial Orthop 1986;90:52-62.
[10]. **Subtelny JD**. A longitudinal study of soft tissue facial structurs and their profile characteristics, defined in relation to underlying skeletal structures. Am J Orthod 1959;45:481 507.
[11]. **Mirabella D, Bacconi S, Gracco A, Lombardo L, Siciliani G**. Upper lip changes correlated with maxillary incisor movement in 65 orthodontically treated adult patients. World J Orthod 2008;9:337-48.
[12]. **Scott Conley R, Jernigan C**. Soft tissue changes after upper premolar extraction in Class II camouflage therapy. Angle Orthod 2006; 76:59-65.
[13]. **Oliver BM**. The influence of lip thickness and strain on upper lip response to incisor retraction. Am J Orthod 1982;82:141-9.
[14]. **Utsuno H, Kageyama T, Uchida K, Yoshino M, Miyazawa H,**
[15]. **Inoue K**. Facial soft tissue thickness in Japanese children. Forensic Sci Int 2010;199:109.e1-6.
[16]. **Utsuno H, Kageyama T, Uchida K, Yoshino M, Oohigashi S, Miyazawa H, et al**. Pilot study of facial soft tissue thickness differences among three skeletal classes in Japanese females. Forensic Sci Int 2010;195:165.e1-5.
[17]. **Kamak H, Celikoglu M**. Facial soft tissue thickness among skeletal malocclusions: is there a difference? Korean J Orthod 2012;42: 23-31.
[18]. **Hwang HS, Kim WS, McNamara JA Jr**. Ethnic differences in the soft tissue profile of Korean and European-American adults with normal occlusions and well-balanced faces. Angle Orthod 2002; 72:72-80.
[19]. **Ioi H, Nakata S, Nakasima A, Counts AL**. Comparison of cephalometric norms between Japanese and Caucasian adults in anteroposterior and vertical dimension. Eur J Orthod 2007;29:493-9.
[20]. **Shindoi JM, Matsumoto Y, Sato Y, Ono T, Harada K**. Soft tissue cephalometric norms for orthognathic and cosmetic surgery. JOral Maxillofac Surg 2013;71:e24-30.
[21]. **Hoffelder LB, de Lima EM, Martinelli FL, Bolognese AM**. Soft-tissue changes during facial growth in skeletal Class II individuals. Am J Orthod Dentofacial Orthop 2007;131:490-5.
[22]. **Kim KH, Choy KC, Yun HS**. Cephalometric analysis of skeletal Class II malocclusion in Korean adults. Korean J Orthod 2002;32: 241-55.
[23]. **Blanchette ME, Nanda RS, Currier GF, Ghosh J, Nanda SK**. A longitudinal cephalometric study of the soft tissue profile of shortand long-face syndromes from 7 to 17 years. Am J Orthod Dentofacial Orthop 1996;109:116-31.
[24]. **Macari AT, Hanna AE**. Comparisons of soft tissue chin thickness in adult patients with various mandibular divergence patterns. Angle Orthod 2014;84:708-14.
[25]. **Karlsen AT**. Craniofacial growth differences between low and high MP-SN angle males: a longitudinal study. Angle Orthod 1995;65: 341-50.
[26]. **Kang CS, Kim KH, Choy KC**. The vertical changes of the lip and perioral soft tissue resulting from incisor retraction. Korean J Orthod 2000;30:185-96.
[27]. **Legan HL, Burstone CJ**. Soft tissue cephalometric analysis for orthognathic surgery. J Oral Surg 1980;38:744-51.
[28]. **Dalhberg G**. Statisitical methods for medical and biological students. New York: Interscience Publications; 1940.
[29]. **Peck S, Peck L, Kataja M**. The gingival smile line. Angle Orthod 1992;62:91-100.
[30]. **Hwang MS, Yoon YJ, Kim KW**. An epidemiologic study on the orthodontic patients who visited department of orthodontics, Chosun University dental hospital last 10 years (1990-1999). Korean J Orthod 2001;31:283-300.
[31]. **Isaacson JR, Isaacson RJ, Speidel TM, Worms FW.** Extreme variation in vertical facial growth and associated variation in skeletal and dental relations. Angle Orthod 1971;41:219-29.
[32]. **Schudy FF.** Vertical growth versus anteroposterior growth as related to function and treatment. Angle Orthod 1964;34:75-93.
[33]. **Creekmore TD**. Inhibition or stimulation of the vertical growth of the facial complex, its significance to treatment. Angle Orthod 1967;37:285-97.
[34]. **Sung JO, Kyung HM, Kwon OW, Sung JH**. Cephalometric norms for orthognathic surgery. Korean J Orthod 1989;19:169-85.

[35]. **Al-Hamdany AK**. Integumental lips' height and separation in different angle's classes of malocclusions. Al-Rafidain Dent J 2007;7:38-49.
[36]. **Chung CH, Mongiovi VD**. Craniofacial growth in untreated skeletal Class I subjects with low, average, and high MP-SN angles: a longitudinal study. Am J Orthod Dentofacial Orthop 2003;124: 670-8.
[37]. **Chung CH, Wong WW**. Craniofacial growth in untreated skeletal Class II subjects: a longitudinal study. Am J Orthod Dentofacial Orthop 2002;122:619-26.
[38]. **Angle E**. Classification of malocclusion. Dent Cosmos 1899;41: 248-64.
[39]. **Subtelny JD**. The soft tissue profile, growth and treatment changes. Angle Orthod 1961;31:105-22.
[40]. Hahn **von Dorsche S, Fanghanel J, Kubein-Meesenburg D, Nagerl H, Hanschke M**. Interpretation of the vertical and longitudinal growth of the human skull. Ann Anat 1999;181:99-103.
[41]. **Phillips VM, Smuts NA.** Facial reconstruction: utilization of computerized tomography to measure facial tissue thickness in a mixed racial population. Forensic Sci Int 1996;83:51-9.
[42]. **Aulsebrook WA, Becker PJ, Iscan MY**. Facial soft-tissue thicknesses in the adult male Zulu. Forensic Sci Int 1996;79:83-102.
[43]. **Hashim HA, AlBarakati SF**. Cephalometric soft tissue profile analysis between two different ethnic groups: a comparative study. J Contemp Dent Pract 2003;4:60-73.