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Original Research Article

Evaluation of Soft Tissue Measurements in Skeletal Class II Division I Malocclusion with Low Mandibular Plane Angel in Himachali Population: A Lateral Cephalometric Study

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Abstract

Aim: To evaluate the soft tissue characteristics of skeletal Class II Division 1 subjects (group II) with low mandibular plane angel 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 2 groups based on horizontal and vertical skeletal pattern (SN-MP angle): group I, 50 subjects; group II-low angle (<27°), 50 subjects. The correlations and multiple linear regression tests were used to determine the skeletal and dental variables influencing soft tissue characteristics. ***Results:*** For the soft tissue analysis of all subjects, lower lip thickness was significantly increased in group II-L compared with group I. 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 influenced 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: Soft tissue evaluation, Class II division 1 malocclusion, cephalometry.

INTRODUCTION

To maintain facial harmony along with occlusal excellence, it is necessary to determine the facial appearance by soft tissue analysis as well as underlying skeletal pattern in orthodontic treatment planning is necessary.

Riedel stated that the hard tissue profile outline bear harmonious relationship to patient's good profile [3]. It was found that lip position was closely correlated with the underlying dental and alveolar structures so an orthodontist can modify the position of teeth and alveolar structures to improve facial esthetics [4]. 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.

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. The aims of this study were to determine the characteristics of soft tissues evaluation in Himachali adults with skeletal Class II Division 1 malocclusions according to low 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.

MATERIAL AND METHODS

This study was conducted in the department of Orthodontics and Dentofacial Orthopaedics. The 100 subjects were divided into two groups.

GROUP I: Skeletal class I (control group)

GROUP II: Skeletal class II division I malocclusion with low Mandibular plane angle (SN – MP < 27)

The inclusion criteria for GROUP I were as follows

- Skeletal class I malocclusion with class I molar and class I canine relation
- Normal overjet and normal overbite
- No missing teeth except third molar
- Absence of crowding
- No alteration of facial morphology

The inclusion criteria for GROUP II were as follows

- Skeletal class II malocclusion (ANB > 4, Wits appraisal > 0 and maxillary central incisor to Sella-Nasion,> 95)
- Class II molar and class II canine relation
- 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 axes 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.

STATISTICAL ANALYSIS

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

- Descriptive Statistics: Mean, standard deviation (SD), minimum, and maximum values.
- Inferential Statistics
  - 1-way analysis of variance: comparison among groups
  - Post hoc Scheff'e test: to analyze differences between the groups.

RESULTS

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

Table II. Lower lip length was significantly greater for groups I compared with group II. Also, there were statistical differences between groups in soft tissue contours, hard tissue contours and contour ratio.

Table III, 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).

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 steeper and more the chin moves backward, and vice versa [29-31].

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 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 no significant difference between group I and group II. This is 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].

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±1.3, and 3.04±0.83 mm for groups I and II) in our study groups which was influenced by proclination and saggital position of upper incisors. Thus, presumption of soft tissue change rather is 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 I and this might be because of the compensating effort. 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.

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.

CONCLUSIONS

- The basic lower lip thickness and lower lip length had significantly greater values in Class II Division 1 malocclusion as compared to class I skeletal malocclusion in Himachali polulation.
- The measurements of soft tissue thickness were related 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.

- In the skeletal Class II subjects, upper lip strain was influenced by the inclination and the anteroposterior position of the maxillary incisors.
- 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									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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

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

Descriptives									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
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
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
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
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
BASIC LOWER LIP THICKNES	I	26	12.58	1.793	.352	11.85	13.30	10	15
	II L	26	12.62	.941	.185	12.24	13.00	11	14
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
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
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
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
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
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
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
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
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
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
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
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
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

Table-III: Pearson correlation coefficients of group II between soft tissue thickness and skeletal and dental variables

		BASIC UPPER LIP THICKNESS	UPPER LIP THICKNESS	UPPER LIP STRAIN	LOER LIP THICKNESS	BASIC LOWER LIP THICKNESS	CHIN THICKNESS H	CHIN THICKNESS 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	CONTORATIO (%)
SNMP	R	-.132	-.123	-.078	-.426*	-.358	-.096	.156	.521**	.362	.432*	.304	-.197	.193	-.401*	-.438*	-.029	-.014	.402*
	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*	.238	.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. LEN.	R	-.156	-.018	-.139	-.326	-.242	-.261	-.297	.217	-.138	.105	-.003	-.280	.299	-.278	-.230	.192	-.533**	.164
	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/NA mm	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

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