

## Soft Tissue Chin Thickness Comparisons in Indian Adult Class II Division 1 Subjects



### Medical Science

KEYWORDS :

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### ABSTRACT

*Thickness of soft tissues may affect the position and relationships among facial structures affecting facial esthetics. Such differences between skeletal and soft tissues can cause a disassociation between the position of underlying bony structures and facial appearance that may shift treatment into the range of orthognathic and cosmetic surgery.*

*AIM: To evaluate the association between soft tissue chin (STC) thickness and mandibular divergence in adult Class II division 1 subjects.*

*MATERIALS AND METHODS: Adult patients with Class II division 1 malocclusion and mean age of 22.4 years were divided into four groups based on cephalometric mandibular plane inclination(MP) to anterior cranial base(SN) as: Low MP/SN  $\leq 27^\circ$ , medium-low  $27^\circ$  to  $< 32^\circ$ , medium- high  $32^\circ$  to  $< 37^\circ$  and high  $\geq 37^\circ$ . The soft tissue chin (STC) thicknesses were measured at Pogonion(Pog), Gnathion(Gn) and Menton(Me). Student's t-test, Two-way ANOVA and Post-Hoc tests were used for statistical analysis.*

*RESULTS: All STC measurements were greater in hypodivergent and lowest in hyperdivergent groups in both genders.*

*CONCLUSION: In Class II division 1 subjects with retrognathic mandibles, who require sagittal mandibular advancement with orthodontic or orthognathic surgical corrections, an increased soft tissue chin thickness can help in achieving esthetic facial profiles with minimal corrections.*

### INTRODUCTION

Facial contours are determined by soft tissues and these can be altered by growth and orthodontic treatment.<sup>1,2</sup> There is great individual variation in period, magnitude and pattern of growth in different parts of the face. Thus, studying these variables is fundamental for orthodontic treatment. Soft tissue evaluation in Class II subjects should be done along with hard tissue evaluation for successful treatment outcome. The covering facial soft tissues (muscles, fat, skin) can develop in proportion or disproportion to the corresponding skeletal structures. Variations in thickness, length and tonicity of the soft tissues may affect the position of and the relationships among the facial structures thereby affecting facial esthetics. Such variations between skeletal and soft tissues can cause a disassociation between the position of the underlying bony structures and the facial appearance that may shift treatment into the range of orthognathic and cosmetic surgery.

In orthodontic literature, minimal attention has been dedicated to the role of soft tissue characteristics in establishing an optimal diagnosis and treatment plan. Most studies of facial soft tissues are primarily concerned with changes after orthodontic treatment.<sup>3,4</sup>

The aims of this study were to evaluate the following in adult Class II Division 1 subjects in Indian population:

1. The association between mandibular divergence and soft tissue chin thickness (STC) measured at different chin levels.
2. The differences in soft tissue chin(STC) thickness between men and women.

### MATERIALS AND METHODS

Pre-treatment lateral cephalograms of 80 (40 male and 40 female) adult Indian subjects with Class II division 1 malocclusion were collected. Mean age of subjects was 22.4 years, (range 18–30 years). The lateral cephalograms were taken at rest with no lip strain, with well-defined and identifiable chin structures seen on the radiograph. Exclusion criteria were previous orthodontic and or orthognathic surgery treatment, presence of craniofacial anomalies, or presence of a non continuous soft tissue contour at the level of the chin indicating a chin strain. The lateral cephalometric radiographs were taken using the same cephalostat in a standardized method and in natural head position(NHP).

Angular measurements were computed to determine the vertical position of the maxilla and mandible in relation to the anterior cranial base, to true horizontal and to each other. The angles included palatal plane to mandibular plane (PP/MP), palatal plane to horizontal (PP/H), mandibular plane to horizontal (MP/H), and mandibular plane to anterior cranial base (MP/SN). The sagittal relationship between the jaws was assessed by the ANB angle. The soft tissue chin (STC) thickness was measured at three different levels.

1. Pog-Pog' = length between bony Pogonion (Pog) and its horizontal projection (Pog') over the vertical passing through soft tissue Pogonion.
2. Gn-Gn' = distance between bony Gnathion (Gn) and soft tissue Gnathion (Gn').
3. Me-Me' distance between bony Menton (Me) and its vertical projection (Me') on the horizontal passing through soft tissue Menton.

Patients were divided into four groups based on divergence pattern defined by the mandibular plane to cranial base angle.

Low MP/SN  $\leq 27^\circ$  (Fig.1), medium-low  $27^\circ$  to  $< 32^\circ$  (Fig.2), medium high  $32^\circ$  to  $< 37^\circ$  (Fig.3), high  $\geq 37^\circ$  (Fig.4) with n= 10 male and 10 females.

Age difference between genders in the total sample was evaluated with the Student's t-test. Two-way analysis of variance and post-hoc test were used for multiple comparisons (cephalometric angular and STC measurements) among the four groups.

### RESULTS

No statistical difference and significance was seen in men or women across the four groups or between men and women within each of the four groups. ANB angle in all groups was not significant. PP/H (palatal plane to horizontal) in low medium low, medium low to high and in high groups were insignificant. All STC thicknesses had the highest measurements in the hypodivergent group and gradually decreased across the groups, the lowest being in the hyperdivergent group in both males and females. Medium – low group in females had greater Pog-Pog' and reduced Me-Me' soft tissue thickness as compared to other groups.

### DISCUSSION

The study tried to determine the association between mandibu-

lar vertical divergence and soft tissue chin thickness in Class II division 1 subjects. With the shift of orthodontic paradigms from hard tissues to soft tissues, greater emphasis is being placed on soft tissue examination during clinical diagnosis and treatment planning.<sup>5,6</sup> The soft tissues which cover bones and teeth are highly variable in thickness.<sup>7</sup> Variations are greater in subjects with different mandibular divergences. Patients may have either more or less convex profiles because of the thicknesses of their soft tissues rather than actual hard tissues.<sup>8</sup>

During growth, patients with greater MP/SN angle had thinner soft tissue chin thickness. The soft tissue chin thickness apparently adapts to severe hyperdivergence.<sup>9,10</sup> Gender differences were also seen. Men had thicker soft tissues as compared to women. During growth, the soft tissues adapt to different mandibular divergences. Differences in chin thicknesses at different points on chin contour are seen. Subjects with hypodivergent profiles have increased soft thickness and hyperdivergent subjects have reduced thickness due to adaptation soft tissues. Previous studies were carried out by studying the soft tissues during growth and development which supported the differences in soft tissue chin thicknesses.

**CONCLUSIONS**

Class II division 1 subjects with varying mandibular divergences have differences in soft tissue chin thicknesses. Sagittal mandibular advancement improves their facial profile. Soft tissue examination along with clinical findings and cephalometric analysis should dictate the orthodontic treatment. Hypodivergent subjects have increased thickness at Pogonion and hypodivergent subjects have reduced thickness at Pogonion and varying thicknesses at Gnathion and Menton. Differences in soft tissue thicknesses should be kept in mind while planning orthodontic treatment. In some clinical situations, soft tissue compensations can help convert a surgical situation to a well camouflaged orthodontic result making treatment results more predictable and stable.

**Fig.1. Low MP/SN  $\leq 27^\circ$**



**Fig.2. Medium-low  $27^\circ$  to  $< 32^\circ$**



**Fig.3. Medium high  $32^\circ$  to  $< 37^\circ$ F**



**Fig.4. High  $\geq 37^\circ$**



**TABLE 1- DESCRIPTIVE STATISTICS**

	TOTAL	LOW MP/SN ≤27°	MEDIUM -LOW 27° TO < 32°	MEDIUM HIGH 32° TO < 37°	HIGH ≥ 37°	P <sup>b</sup>
TOTAL SAMPLE	N= 80	20	20	20	20	NS
AGE, Y (RANGE)	22.4 years (18-30 years)	24.1 years (18-30 years)	22.75 years (18-29 years)	22.95 years (18-30 years)	22.95 years (19-30 years)	
MEN, AGE, Y (RANGE)	N= 40 22.35 years (18-30 years)	N= 10 21.5 years (18-27 years)	N= 10 22.7 years (18-29 years)	N= 10 22.8 years (18-30 years)	N= 10 22.4 years (19-26 years)	NS
WOMEN, AGE, Y (RANGE)	N= 40 22.5 years (18-30 years)	N= 10 24.1 years (18-30 years)	N= 10 22.8 years (18-29 years)	N= 10 22.1 years (18-26 years)	N= 10 21.3 years (19-30 years)	
P <sup>a</sup>	NS	NS	NS	NS	NS	

MP/SN = Mandibular plane to anterior cranial base, NS = Not significant.

**TABLE 2- MEANS OF AGE, SELECTED CEPHALOMETRIC AND SOFT TISSUE CHIN MEASUREMENTS IN VARIED GROUPS ON MP/SN IN INDIAN CLASS II DIVISION -1 SUBJECTS**

GROUPS	LOW MP/SN ≤27°		MEDIUM-LOW 27° TO < 32°		MEDIUM HIGH 32° TO < 37°		HIGH ≥ 37°		ANOVA
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	
AGE, Y	24.1	3.7	22.75	3.4	22.95	3.0	22.95	2.98	
<b>SKELETAL MEASUREMENTS</b>									
PP/MP	15.9	5.15	27.25	4.6	26.65	5.18	32.85	3.3	
PP/H	3.45	2.4	6.25	5.8	3.65	2.4	5.52	5.7	
MP/H	16.55	6.4	23.2	5.8	28.5	5.31	5.52	5.6	
MP/SN	22.15	3.58	30.65	1.18	34.25	1.33	40.2	2.52	
ANB	5.2	1.64	4.8	0.8	5.05	1.63	5.85	1.5	
<b>SOFT TISSUE CHIN THICKNESS</b>									
Pog- Pog'	12.65	2.49	12.8	1.23	11.15	1.5	10.0	2.77	
Gn-Gn'	9.65	3.23	7.2	2.58	8	1.21	6.75	2.44	
Me-Me'	8.1	1.8	6.9	1.8	7.35	1.22	5.95	0.8	

**TABLE 3- COMPARISONS AMONG GROUPS**

GROUPS	L-ML	L-MH	L-H	ML-MH	ML-H	MH-H
AGE, Y	NS	NS	NS	NS	NS	NS
<b>SKELETAL MEASUREMENTS</b>						
PP/MP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PP/H	NS	0.001	0.008	0.04	NS	NS
MP/H	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
MP/SN	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ANB	NS	NS	NS	NS	NS	NS
<b>SOFT TISSUE CHIN THICKNESS</b>						
Pog- Pog'	NS	NS	NS	NS	NS	NS
Gn-Gn'	NS	NS	.002	NS	0.004	0.016
Me-Me'	NS	NS	.006	NS	NS	NS

**TABLE 4- MEAN MEASUREMENTS OF SOFT TISSUE AT THE CHIN IN GROUPS STRATIFIED ON MP/SN AND GENDER IN INDIAN CLASS II DIVISION I SUBJECTS**

GROUPS	LOW MP/SN ≤27°		MEDIUM-LOW 27° TO < 32°		MEDIUM HIGH 32° TO < 37°		HIGH ≥ 37°		ANOVA
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	
MEN									
Pog- Pog'	13.3	2.5	12.9	1.5	11.7	1.5	11.2	3.6	NS
Gn-Gn'	9.3	1.8	8.5	2.3	8.6	1.17	5.6	0.5	NS
Me-Me'	8.6	1.5	8.2	1.6	6.9	0.8	6	0.8	NS
<b>WOMEN</b>									
Pog- Pog'	12	2.3	12.7	0.9	10.6	1.5	9.3	1.2	NS
Gn-Gn'	10	4.2	5.8	1.9	7.4	0.96	7.9	3	NS
Me-Me'	7.6	1.9	5.6	0.6	7.8	1.3	5.9	0.8	NS

**REFERENCE**

1. Hoffelder LB, Lima EM, Martinelli FL, Bolognese AM. Soft tissue changes during facial growth in skeletal Class II individuals. Am J Orthod Dentofacial Orthop. 2007;131:490-495. | 2.Steiner CC. The use of cephalometrics as an aid to planning and assessing orthodontic treatment. Am J Orthod. 1960; 46:721-735. | 3.Blanchette M, Nanda R, Currier F, Ghosh J, Nanda S. A longitudinal cephalometric study of the soft profile of short and long-face syndromes from 7 to 17 years tissue. Am JOrthodDentofacOrthop. 1996;109:116-131. | 4.Holdaway RA. Soft-tissue cephalometric analysis and its use in orthodontic treatment planning. Part I. Am JOrthod. 1983;84:1-28. | 5. Uysal T, Baysal A, Yagci A, Sigler LM, McNamara JA Jr. Ethnic differences in the soft tissue profiles of Turkish and European-American young adults with normal occlusions and well-balanced faces. Eur J Orthod. 2012;34:296-301. | 6. Macari AT, Hanna AE. Comparisons of soft tissue chin thickness in adult patients with various mandibular divergence patterns. Angle Orthod. 2014. | 7. Park YC, Burstone CJ. Soft tissue profile: fallacies of hard tissue standards in treatment | planning. Am J Orthod Dentofacial Orthop 1986;90:52-62. | 8. Scheideman GB, Bell WH, Legan HL, Finn RA, ReichJS.Cephalometric analysis of dentofacial normal. Am J Orthod.1980;78:404-420. | 9.Subtelny JD. A longitudinal study of soft tissue facial structures and their profile characteristics, defined in relation to underlying skeletal structures. Am J Orthod. 1959;45: | 481-507. | 10. Burstone C. Lip posture and its significance in treatment planning. Am J Orthod. 1967;53:262-284. |