Volume 04, Issue 06 (November-December 2021), PP 13-18 **www.ijmsdr.org**
ISSN: 2581-902X

International Journal of Medical Science and Dental Research

Soft Tissue Analysis of Chin in Patients with Different Mandibular Divergent Patterns in Himachali Population

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ABSTRACT:
Introduction : The soft tissue of the face plays an important role in facial esthetics. Lower third of the face constitutes the lips and the chin throat region and has a unique impact on the facial dynamics. With continuing growth, the chin tends to assume forward position relative to the superior aspects of the skeletal face and the mandible grows from the more retruded to a less retruded position.. Objective : Determination of STC thickness and its relation with mandibular divergence. Material and Methods: Pretreatment lateral cephalograms of 150 subjects (80males 70 females) aged 18–45 years. On basis of mandibular plane angle 4 groups, Low angle, Medium-Low, Medium-High, High angle were formed. The STC thickness was measured at 3 levels: Pog-Pog', Gn-Gn', Me-Me'. Results:The analysis of variance and post-hoc test were also used to compare the studied parameters separately among groups. the STC was more in males. STC thickness was greater in the low-angle group, and gradually decreases across groups, the least being in the high-angle group.Conclusion: The STC thickness was more in men as comapared to females,STC measurements were less in patients with vertical hyperdivergent pattern and thickness was significantly thinner at Me in cases of hyperdivergent pattern

KEYWORDS: *chin thickness, facial profile, lateral cephalogram, mandible, mandibular plane angle*

I. INTRODUCTION

Facial esthetics is an important goal of treatment for contemporary orthodontics and it is one of the patient's main reasons for seeking orthodontic treatment. The soft tissue of the face plays an important role in facial esthetics and the orthodontist is frequently questioned about facial changes after treatment.[1]

Lower third of the face constitutes the lips and the chin throat region and has a unique impact on the facial dynamics.[2] Björk and Palling found that during the earlier teenage years, growth of the mandible exceeds that of the maxilla resulting in straightening of the profile.[3] The chin is incompletely formed in the infant. The mandible of the young child is quite small and retrusive relative to the upper jaw. The anterior cranial fossa is developmentally precocious. Hence, the nasomaxillary complex is carried to a more protrusive position. The mandible, which articulates on the middle cranial fossae, is located more posteriorly. With continuing growth, the chin tends to assume forward position relative to the superior aspects of the skeletal face and the mandible grows from the more retruded to a less retruded position.[4]

Genecov et al[5] documented that soft tissue chin thickness in females from age 7 to 9 yrs was greater than males in Nanda's study[5], the soft tissue thickness over the chin, symphysis thickness, and the length of the mandibular corpus, all 3 distances increased with age, the males showing the largest increments.

The soft tissue pogonion is an important facial landmark that determines the degree of profile convexity. The vertical growth of the jaws carries pogonion (Pog) downward, while their antero-posterior growth carries it forward.[7]

The soft tissue structures overlying other skeletal landmarks do not show the same pattern of change as that observed for the bony profile. Enough literature is available on the changes in the soft tissue of the patient post orthodontic treatment but in this study we have measured the soft tissue chin thickness of the individuals and its association with the mandibular growth pattern in Himachali population.

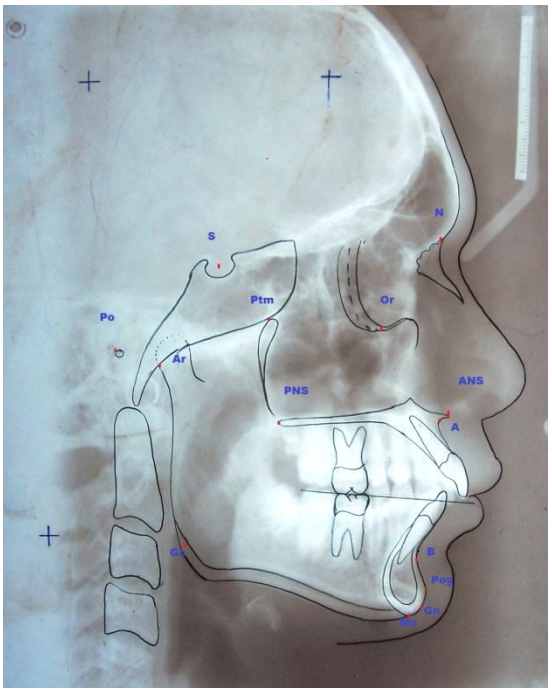
II. MATERIAL AND METHODS

Pretreatment lateral cephalograms of 150 subjects (80males and 70 females) aged 18–45 years were collected from the archives of Department of Orthodontics and Dentofacial Orthopedics of Himachal dental college. Lateral cephalogram of the patients were taken in natural head position.

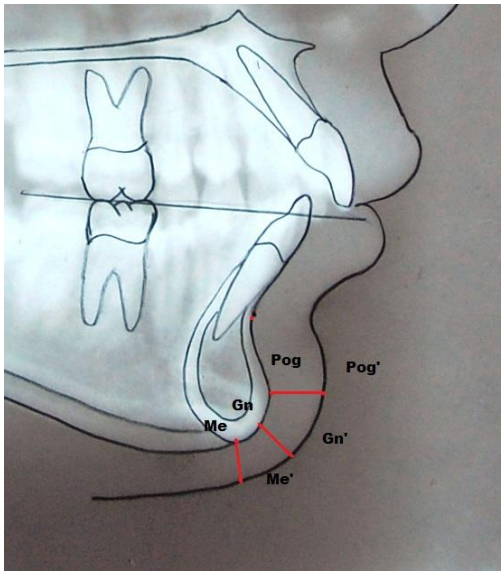
On the basis of the mandibular plane angle(MP-SN) evaluated from the lateral cephalograms of the patients the samples were divided into four groups .

1. Low (L) angle - mandibular divergence angle measuring in the range $\leq$ 27º (n = 40, 18 males, 22 females)
2. Medium-Low (ML) = mandibular divergence angle measuring in between 27˚ < 32˚ (n = 41, 21 males , 20 females)
3. Medium-High (MH) = mandibular divergence angle measuring in between 32˚ < 37˚(n= 42, 25 males , 17 females)
4. High (H) angle = mandibular divergence angle measuring ≥37˚(n = 27, 16 males , 11 females)

All the lateral cephalometric films were placed on transparent cellulose sheet of 0.003" thickness. All the reference points were identified, located and marked. (Figure 1)



(Figure 1)



(Figure 2)

The STC thickness was measured at 3 different levels: Pog-Pog' = length between bony Pog and its horizontal projection (Pog') over the vertical passing through soft tissue Pog, Gn-Gn' = distance between bony Gnathion (Gn) and soft tissue Gn', and Me-Me' = distance between bony Menton (Me) and its vertical projection (Me') on the horizontal passing through soft tissue Me (Figure 2)

III. METHOD ERROR

All measurements on the lateral cephalogram were made twice by the same examiner to minimize the error of measurements. Assessment of the intra-examiner reliability analysis was performed using Kappa statistics. The intra-examiner reliability was found to be Kappa= 0.80-1.00 ($p < 0.001$) which shows perfect agreement according to Landis and Koch (1997).

IV. STATISTICAL ANALYSIS

The results obtained were analyzed using SPSS (Statistical Package for Social Sciences) software version 18. The analysis of variance and Tukey's *post-hoc* test were used for multiple comparisons (STC measurements) among the 4 groups. The analysis of variance and *post-hoc* test were also used to compare the studied parameters in males and females separately among the 4 groups, and the comparison of differences between genders within each group was achieved with the Mann-Whitney test.

Spearman correlation coefficients were calculated to evaluate the associations between the variables and angular values. Results were considered statically significant at $p < 0.05$.

V. RESULTS

Table 1 showed us the gender comparison in chin thickness and the chin thickness was more in males as compared to females

Table 1. Descriptive statistics for age

Groups	Total	L Group	ML Group	MH Group	H Group	p
N	150	40	41	42	42	
Age (in years)	21. 32 ± 3.81	22.34 ± 3.19	21.28 ±3.12	22.15 ± 2.19	18.55± 3.81	0.07
Men	80	18	21	25	16	0.016*
	23.11± 2.22	23.33±1.2	22.66±2.55	21.88±3.12	16.55±3.22	
Women	70	22	20	17	11	0.19
	21.55± 3.12	22.55±3.22	21.43±2.21	19.45±2.34	14.44±3.33	
P	0.11	0.89	0.17	0.54	0.47	

In TABLE 2 , When comparing all the groups, STC thickness was greater in the low-angle group (L), and it gradually decreases across the groups, the least being in the high-angle group (H). At the level of Gn, the distance Gn-Gn' was statistically significantly different between groups L-H (p <.05). At the level of Me, Me-Me' was statistically significantly different between groups L-H, ML-H (p <.05). At the level of Pog, Pog-Pog' was statistically significantly different between groups L-H, ML-H, and MH-H (p <.05)

Table 2: Means of soft tissue chin measurements and mandibular plane angle in different groups

Groups	Mean ± SD				p
	L Group	ML Group	MH Group	H Group	
Soft tissue chin measurements (mm)					
Pog-pog’	10.11±1.77	9.33±2.22	9.23±2.12	9.01±1.23	0.002*
Gn-Gn’	8.45±2.12	7.98±12	7.77±1.21	6.98±2.12	0.004*
Me- Me’	7.11 ±1.23	6.77±2.22	6.87±1.28	6.10±.55	0.001*
Skeletal measurement					
MP-SN	24.55±1.23	29.03±2.12	34.11±2.11	39±1.67	0.003*

COMPARISON AMONG GROUPS(p values)

Group	L-ML	L-MH	L-H	ML-MH	ML-H	MH-H
Soft tissue chin measurements (mm)						
Pog-pog’	0.257	0.411	0.001*	0.883	0.045*	0.019*
Gn-Gn’	0.334	0.545	0.007*	0.898	0.112	0.223
Me- Me’	0.675	0.345	0.004*	0.787	0.006*	0.088

Skeletal measurement						
MP-SN	0.001*	0.006*	0.001*	0.03*	0.004*	0.008*

Table 3 Depicts the correlations in between the chin thickness and mandibular plane

Groups	L (MP-SN ≤ 27º)		ML (MP-SN 27˚ < 32˚)		MH (MP-SN 32˚ < 37˚)		H(MP-SN ≥37˚)	
	R	P	R	P	R	P	R	P
Pog-Pog'	-0.267	0.061	-0.0189	0.33	-0.199	0.243	-0.0167	0.64
Gn-Gn'	-0.210	0.011*	-0.167	0.211	-0.110	0.122	-0.156	0.321
Me-Me'	-0.266	0.022*	-0.189	0.323	-0.154	0.378	-0.134	0.11

VI. DISCUSSION

The soft tissue covering of the face is very important to the orthodontist. Most of us are familiar with xrays, models and photographs that we forget to look at the forehead, lips , chin and nose of the patient which constitute the soft tissue framework of an individual with which orthodontist is most concerned.[8]

The old concept that the soft tissue curtain will take care of itself when the occlusion is corrected has shifted research and investigation of this important part of our work.

The soft tissues that cover bones and teeth are highly variable in thickness, and variations are greater in subjects with different growth pattern. The convexity of the profile depends upon the thickness of the overlying soft tissues more than actual hard tissues

Facial profile assessment can be affected by factors including ethnic, racial, and the time aspects. An inverse correlation was reported between the convexity of skeletal and soft tissues profile. The tendency of reduction of the convexity of the skeletal profile occurs because of the protrusion of the chin. The soft tissue profile does not behave the same indicating a different mechanics of growth for soft tissue thickness.[9]

Our study showed us that the chin thickness is thinner at all the chin levels and varies as per the divergence of the mandible which was in accordance to the study conducted by Somaiah et al. This was also in accordance with the study conducted by Macari et al which stated that the soft tissue chin thickness apparently adapts to severe hyperdivergence mainly by stretching of the soft tissue in children with progressive increase in facial divergence.[10]

In men soft tissue chin thickness was more as compared to females which was in accordance to the study conducted by Brodie et al, Macari et al[11] and Taki et al[12]

In table 2 the soft tissue chin thickness was minimum in the H group at Me level this might be because hypodivergent patients may require reduction genioplasty, or vertical augmentation genioplasty, or even sliding genioplasty for correction of any possible facial asymmetry which was in accordance with the study conducted by Hoffelder et al.[13]

In our study negative correlation was found in between the soft tissue chin thickness and the mandibular place angle because finding suggests that as the vertical expansion of the skeletal tissues increases, it impinges on the thickness of a soft tissue that no longer displaces in a corresponding ratio of 1:1. This ratio has been reported in

clinically normal development and after orthognathic surgery of the mandible and chin. This was in accordance with the study conducted by Shaughnessy et al.[14]

VII. CONCLUSIONS

-The soft tissue chin thickness was more in men as comapared to females.

-Soft tissue chin measurements were less in patients with vertical hyperdivergent pattern as compared to the patients with normodivergent patterns

-The soft tissue chin thickness was significantly thinner at Me in cases of hyperdivergent pattern

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