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A CEPHALOMETRIC STUDY TO COMPARE THE SOFT TISSUE NOSE AND CHIN THICKNESS IN ADULT PATIENTS WITH VARIOUS MANDIBULAR DIVERGENCE PATTERNS

Orthodontology

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ABSTRACT

AIM: To evaluate and compare the soft tissue nose and chin thickness in adult patients with various mandibular divergence patterns.

MATERIALS AND METHODS: 150 lateral cephalogram of adult patients were divided into three groups: Horizontal growth pattern (SN/Go-Gn) = <30 degrees, Average growth pattern (SN/Go-Gn) = 30-34 degrees and Vertical growth pattern (SN/Go-Gn) = >34 degrees. The soft tissue nose thickness was measured from tip of the nose to true vertical line (TVL) and chin thickness was measured at pogonion (Pog), gnathion (Gn), and menton (Me). ANOVA, Student's t-test and Tukey Post Hoc test were used with $p \leq 0.05$.

RESULTS: Patients with vertical growth pattern have thinner soft tissue nose and chin thickness. The soft tissue nose and chin thickness measurements were greater in males than females.

CONCLUSION: Subjects with vertical growth pattern have an overall thinner soft tissue nose and chin thickness. This differential thickness warrants us that it is possible to plan for rhinoplasty or genioplasty in such patients when more advancement of the nose or chin is required, so as to compensate for the increased vertical height. Also, males have thicker nose and chin compared to females.

KEYWORDS

Lateral cephalogram, Nose and chin thickness, Mandibular divergence.

INTRODUCTION

The orthodontic literature classifies the facial types according to their sagittal and vertical features.[1] These skeletal classifications of the face influence the orthodontic diagnosis and treatment planning in both growing and non-growing patients.[1,2] The pendulum of orthodontic diagnosis has now shifted from hard tissue evaluation to soft tissue evaluation as the soft-tissue profile can develop in or out of proportion to their underlying skeletal structures and still be in balance and harmony.[3]

The soft tissue nose and chin play a key role in facial aesthetics and there is a marked interrelation between them. Rickets, Holdaway, and Steiner in their analysis have used the soft tissue nose and chin as a reference to describe the facial profile.[4-7] Review of orthodontic literature considers changes in the soft tissue proportion only after the completion of orthodontic treatment.[8-11] However, there has been no study found in orthodontic literature which gives definite values for the soft tissue nose and chin thickness. In addition, there are no studies which give an association between the mandibular growth patterns and the soft tissue nose and chin thickness values.

Hence, the present study aimed to evaluate and compare the following in adult patients using lateral cephalogram: 1. Association between the mandibular divergence patterns and the soft nose and chin thickness at different chin levels. 2. The difference in the soft tissue nose and chin thickness between males and females.

MATERIALS AND METHODS

A power analysis was performed to determine the sample size needed to detect the difference in the soft tissue nose and chin thickness in adults with various mandibular growth patterns. Considering the difference in the group mean to be 20%, power of the study as 80%, at 95% confidence interval, a ratio of sample size (group A/ group B/ group C) as 1 and with the significance level set at 5%, a sample size of 150 was derived (i.e. 50 in each group). Thus, 150 lateral cephalograms of patients above 18 years of age, with all the permanent teeth present and who have not undergone orthodontic treatment / orthognathic surgery were included. Patients having any craniofacial anomalies were excluded from the study.

Patients were divided into three groups based on the inclination of Mandibular plane(Go-Gn) to the Sella-Nasion plane(SN): Horizontal growth pattern with (SN/Go-Gn) = <30 degrees, Average growth pattern with (SN/Go-Gn) = 30-34 degrees and Vertical growth pattern with (SN/Go-Gn) = >34 degrees.

Lateral cephalogram of all the three groups was traced using 0.5mm diameter lead pencil manually.

The Soft Tissue Chin Thickness Was Measured At Three Different Chin Levels: (fig. 1,2,3)

- Pog-Pog' = distance between bony pogonion (Pog) and the soft tissue pogonion (Pog').
- Gn-Gn' = distance between bony gnathion (Gn) and the soft tissue gnathion (Gn').
- Me-Me' = distance between bony menton (Me) and the soft tissue menton (Me').

The Soft Tissue Nose Thickness Was Measured By: (fig. 1,2,3)

- Drawing a true vertical line (TVL) passing through subnasale and a perpendicular distance was measured from the tip of the nose to TVL.

According to Arnett at el, TVL is the most reliable landmark to measure the soft tissue thickness, hence it was used in the study.[8] The radiographs were retraced by the same examiner after 3 to 4 weeks to eliminate the tracing error.



Fig 1: Lateral Cephalogram Tracing Of Patient With Horizontal Growth Pattern.

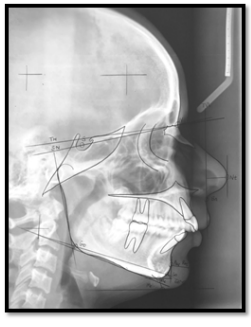


Fig 2: Lateral Cephalogram Tracing Of Patient With Average Growth Pattern.



Fig 3: Lateral Cephalogram Tracing Of Patient With Vertical Growth Pattern.

STATISTICAL METHODS

The data obtained from all the three groups were tabulated in Microsoft Excel and subjected to the following statistical analysis with the help of SPSS software version 17. Mean and standard deviation were calculated and significance was determined at $p \leq 0.05$. ANOVA test was used to analyze the differences among group means. Tukey post-hoc test (Bonferroni) was used to determine the individual differences. In addition to these tests, Student's t-test was used to compare the mean values of the measurements between genders.

RESULTS

In the present study, we observed that all the soft tissue nose and chin thickness measurements had the highest mean value in the horizontal growth pattern group and gradually decreased across all the other groups, the lowest being in the vertical growth pattern group. (Table 1) At the level of Gn, the distance Gn-Gn' in horizontal growth pattern group was 9 mm, average growth pattern group was 8.24mm and vertical growth pattern group was 8 mm. Statistically, a significant difference was observed between horizontal and vertical growth pattern groups p = <0.020*. (Table 2) At the level of Me, the distance Me-Me' in horizontal growth pattern group was 7.47 mm, average growth pattern group was 6.79 mm and vertical growth pattern group was 6.50 mm. There was a statistically significant difference between the horizontal and average growth pattern groups p = <0.025* as well as between the horizontal and vertical growth pattern groups p = <0.001**. (Table 2) However, at the level of Pog, (Pog-Pog') no significant difference was observed among all the three groups. (Table 1) Hence, the present study shows that subjects with horizontal growth pattern have greater soft tissue chin thickness at Gnathion and Menton. The soft tissue nose thickness in horizontal growth pattern group was 13.92 mm, average growth pattern group was 12.94 mm and vertical growth pattern group was 12.79 mm. (Table 3) Statistically, a significant difference was found between the horizontal and average growth pattern groups p = <0.03* and also between the horizontal and vertical growth pattern groups p = <0.001**. (Table 4) Hence, the result of the present study shows that as the mandibular plane increases the soft tissue nose thickness decreases.

Upon comparison between males and females, significant differences were found in the soft tissue nose thickness measurement p = <0.002** and soft tissue chin thickness measurement at Gn and Me with p = <0.029* and <0.001** respectively. (Table 5&6) Thus males have thicker soft tissue nose and chin.

Table 1: Comparison Of The Soft Tissue Chin Thickness At Pog-Pog', Gn-Gn' And Me-Me' In Terms Of {mean (sd)} Among All The 3 Groups Using Anova Test.

Soft tissue chin thickness	Horizontal growth pattern		Average growth pattern		Vertical growth pattern		ANOVA (P)
	Mean	SD	Mean	SD	Mean	SD	
Pog-Pog'	12.00	3.08	11.57	2.60	11.28	2.25	NS
Gn-Gn'	9.00	2.10	8.24	1.70	8.00	1.40	<0.019*
Me-Me'	7.47	1.4	6.79	1.2	6.50	1	<0.001**

(NS = not significant, p < 0.05 - significant*, p < 0.001 - highly significant)**

Table 2: Comparison Of The Soft Tissue Chin Thickness At Gn-Gn' And Me-Me' {in Terms Of Mean (sd)} Among All The 3 Groups Using Tukey's Post Hoc Analysis.

Soft tissue chin thickness	Horizontal and Average growth pattern	Horizontal and Vertical growth pattern	Average and Vertical growth pattern
Gn-Gn'	-	<0.020*	0.084
Me-Me'	<0.025*	<0.001**	0.502

Table 3: Comparison Of The Soft Tissue Nose Thickness In Terms Of [MEAN (SD)] In All The 3 Groups Using ANOVA Test.

Soft tissue nose thickness	Horizontal growth pattern		Average growth pattern		Vertical growth pattern		ANOVA (P)
	Mean	SD	Mean	SD	Mean	SD	
	13.92	1.9	12.94	1.5	12.79	1.2	<0.001**

(p < 0.05 - Significant*, p < 0.001 - Highly significant)**

Table 4: Comparison Of The Soft Tissue Nose Thickness In Terms Of [MEAN (SD)] Among All The 3 Groups Using Tukey's Post Hoc Analysis.

Groups	Horizontal and average growth pattern	Horizontal and vertical growth pattern	Average and vertical growth pattern
Nose thickness	<0.03*	<0.001**	0.864

Table 5: Comparison Of Soft Tissue Chin Thickness Among Males And Females Using Unpaired T Test. (overall)

Variables	Gender	N	Mean	SD	P value
Pog-Pog'	Male	66	11.90	1.6	0.088
	Female	84	11.38	1.3	
Gn-Gn'	Male	66	8.56	1.4	<0.029*
	Female	84	8.32	1.1	
Me-Me'	Male	66	7.18	1.2	<0.001**
	Female	84	6.40	1.1	

Table 6: Comparison Of Soft Tissue Nose Thickness Among Males And Females Using Unpaired T Test. (overall)

Variables	Gender	N	Mean	SD	P value
Nose thickness	Male	66	13.71	1.6	<0.002**
	Female	84	12.82	1.3	

DISCUSSION

Evaluation of the soft tissue parameters in patients undergoing orthodontic treatment or corrective jaw surgery plays a crucial role in orthodontic diagnosis and treatment planning. Both hard and soft tissue norms must be considered in establishing harmonious facial aesthetics and an optimal functional occlusion. The present study aimed to assess and compare the soft tissue nose and chin thickness in adult patients with different mandibular divergence patterns and to compare these values between males and females using lateral cephalogram so as to find out the response of the soft tissues.

The results of the study suggests that patients with vertical growth pattern had an overall thinner soft tissue nose and chin thickness, excluding Pog when compared with the other two groups; these findings suggest that as the mandibular plane increases beyond a certain degree, the soft tissue nose thickness and chin thickness at gnathion and menton decreases and does not displace into 1:1. This ratio has been reported in clinically normal development and after orthognathic surgery of the mandible and chin. More specifically, there was a statistically significant difference between the horizontal and vertical growth pattern groups in the soft tissue chin thickness at Gn and Me, but not at Pog, suggesting the presence of a differential extension between their hard and soft tissues. (Table 1&2) Similar observations have been reported in a study by Murilo Feres at el and Anthony at el.[1,26]

The results of the present study show a statistically significant difference in soft tissue nose thickness measurement among all the 3 groups. Thus, as the mandibular plane increases, the soft tissue nose thickness decreases. Therefore, subjects with horizontal growth pattern have a thicker nose as compared to the subjects with average

and vertical growth pattern. (Table 3&4) There are no studies available in the orthodontic literature which compares the soft tissue nose thickness in subjects with different mandibular divergence patterns.

GENDER DIFFERENCES

The results of the present study showed a statistically significant difference in the soft tissue chin thickness measurements between males and females among all the 3 groups, thereby indicating that females have thinner soft tissue chin than males. (Table 5) The present study is in agreement with those of the other studies which came to the conclusion that the males have thicker soft tissue chin compared to females.[4,14,26-28.]

The results of the present study showed a statistically significant difference in the soft tissue nose thickness measurement between males and females among all the 3 groups. (Table 6) Thus, the results of the present study showed that males exhibit thicker nose as compared to females. The result of the present study is concurrent to the study by Enlow at el and Nahidh at el who reported that the males nose was proportionately larger and thicker than the females.[24,30] There is no study available in the orthodontic literature which compares the soft tissue nose thickness in males and females with various mandibular divergence patterns.

CONCLUSION

The conclusions derived from the present study are as follows:

1) Subjects with vertical growth pattern have an overall thinner soft tissue nose and chin thickness as compared with the other two groups. Thus, these differences in the soft tissue nose and chin thickness measurements among different growth patterns must be taken into account in patients undergoing orthodontics or corrective jaw surgery, both during diagnosis and treatment planning.
2) Males have greater soft tissue nose and chin thickness as compared to females, thus these factors must be considered during treatment planning.
3) The present study also showed that the soft tissue chin thickness in subjects with vertical growth pattern should be considered differently at its most anterior point (Pog) relative to its inferior landmarks (Gn and Me). This differential thickness should be explored in further research, particularly given its potential implications for rhinoplasty/genioplasty in patients with extreme vertical growth pattern who might require greater nose and/or chin advancement to compensate for an increased vertical height.

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