

ORIGINAL ARTICLE

Association of Symphyseal Morphology with Lower Incisor Inclination in Sagittal and Vertical Growth PatternsWAHEED GUL SHAIKH¹, NOSHEEN KHAWAR², ASHA DEVI³, BATOOL SAJJAD⁴, SYED AHMED OMER⁵, MARIUM AZFAR⁶¹Associate Professor, Orthodontic Department, Shahida Islam Dental College, Lodhran²Assistant Professor, HOD Dental Materials Science, Fatima Jinnah Dental College, Karachi³Senior Registrar, Orthodontic Department, PNS Shifa, Karachi⁴Assistant Professor Oral Surgery, Altamash Institute of Dental Medicine, Karachi⁵Professor, HOD, Science of Dental Materials, Bahria University Dental College, Bahria University Health Sciences Campus, Karachi⁶Associate Professor, Department of Community Dentistry, Sindh Institute of Oral Health Sciences, Jinnah Sindh Medical University, KarachiCorresponding author: Waheed Gul Shaikh, Email: dentist_waheed@yahoo.com, Cell: 03009718933**ABSTRACT****Background:** The mandibular symphysis is the bodily carnal part of the mandible that consist of alveolar and cortical bones. The mandibular symphysis has different parts like chin, or mentum that consist of unique features of modern humans.**Objective:** The study aimed to explore the correlation of lower incisor inclination growth pattern with the symphyseal morphology.**Study design:** It is a retrospective study conducted at Orthodontic Department, Shahida Islam Dental College, Lodhran and Fatima Jinnah Dental College, Karachi for the duration of six months from February 2022 to July 2022.**Material and Methods:** The correlation between all parameters was studied by ANOVA and other statistical analysis were also performed. The study approval was taken from the review board and ethical committee of the hospital. A total of 18 patients participated in this study. The patients were classified according to the facial category i.e. long, normal, and short. Class I comprises 8 patients and class III comprises 10 patients.**Results:** An increased value was observed in the case of class I with vertical growth patterns while the value decreased in the case of class III. Three different types of incisor inclinations were observed that is over jet positive, over jet negative, and edge to edge.**Conclusion:** From this study, it is predicted that a correlation exists between vertical growth patterns and sagittal growth patterns for the inclination in incisors. The height and width of the symphysis and facial patterns are also related to vertical growth patterns and indirectly affect the inclination of incisors. High angle facials have thin and long symphysis, while low angle facials have thick and short symphysis.**Keywords:** short symphysis, soft tissue and growth dimension.**INTRODUCTION**

The mandibular symphysis is the bodily carnal part of the mandible that consist of alveolar and cortical bones. The mandibular symphysis has different parts like chin, or mentum that consist of unique features of modern humans. Soft tissue chin is the adjacent soft tissues that are below the lower lips. The basal and alveolar portion are the composite of the hard tissue. The mandibular incisor reside in the alveolar rich and the mandibular symphysis present in the basal portion. The integument mentum is represented by the soft tissue chin. The lower incisor movement are being restricted by the mandibular symphysis dimension. For the treatment it is necessary to assess the tooth movement limit.¹⁻³ Different studies have assess the association of different growth pattern with the mandibular symphysis movement. There is limited information present about the dimension of symphysis so there is need to conduct the study that determine the statistical variation in symphysis dimension. The information about the orthodontic tooth movement can be gain by the study of size and shape of mandibular symphysis. The occlusal and esthetic criteria both are assess by orthodontic during treatment planning. The study aim to assess the symphysis cortical dimensions and their correlation with the lower incisor inclination. The different vertical growth pattern were assessed deeply to make the correlation. For the applied sciences there is need to identify the factor associated⁴⁻⁶ with the symphysis morphology. Anteroposterior orthodontic movement effect the inclination of alveolar symphyseal. For the prediction of mandibular rotation the basal symphysis long axis is studied in detail during growth. The bone grafting that are prior to dental implant replacement is provided by this symphyseal site. In facial aesthetics the bone and chin both play an important role. The skeletal pattern sex and age influence the position and morphology of symphysis. Due to unclear information about the influence of the factor on symphysis morphology inconsistent results are found. For the planning of genioplasty there is need to study the factor associated with the mandibular symphysis morphology. Few studies have reported that the knowledge⁷⁻⁹ about the mandible growth can be assessed by the symphysis morphology and

antegonial notch depth. The symphysis part is represented of growth pattern and direction of growth rotation. The orthodontist are willing to understand the symphysis morphology in context to relationship with anteroposterior jaw. For the achievement of the better results and stability there is need to study the inclination and position of power incisor present within the symphysis. Orthodontist are also interested to explore the relationship of lower incisor angulation and symphysis morphology with¹⁰⁻¹¹ the dentofacial parameters. The morphology of the mandibular symphysis reveals the orthodontic movements that can be performed safely. As a result, prior to treatment, the soft tissues surrounding the teeth must be diagnosed. In this study, pre-treatment cortical dimensions of the symphysis were measured in relation to the incisor inclination. The study aimed to explore the correlation of lower incisor inclination growth pattern with the symphyseal morphology.

MATERIAL AND METHODS

It is a retrospective study conducted at Orthodontic Department, Shahida Islam Dental College, Lodhran and Fatima Jinnah Dental College, Karachi for the duration of six months from February 2022 to July 2022. The correlation between all parameters was studied by ANOVA and other statistical analyses were done. A total of 18 patients participated in this study. The patients were classified according to the facial category i.e. long, normal, and short. Class I comprises 8 patients and class III comprises 10 patients. The selected patients willingly signed the consent. The cephalometric records of each patient was collected. According to the inclusion criteria following patients were selected for the study.

- The patient with no recent history of orthodontic treatment
- The patient with no history of craniofacial anomaly
- The patient with the age more than 18 years

According to the exclusion criteria following patients were excluded from the study

- Patient with missing impacted lower canine
- Patient with missing lower incisor

- Patient with facial asymmetry
Cephalograms were traced. The statistical analysis was performed by using the one of the authentic software SPSS.

RESULTS

In this study, the inclination of the incisor was studied in relation to vertical and sagittal growth planes. Then the inclination of incisors with its two vertical classes and the width and height of Symphyseal was studied. An increased value was observed in the case of class I with vertical growth patterns while the value decreased in the case of class III.

Table 1: Average and standard deviation of various parameters i.e. inclination of incisors, width, and height of Symphyseal

	Classes	Average \pm Standard Deviation
Inclination of incisors	I	101.0 \pm 10.50
	III	86.0 \pm 9.50
Width of Symphyseal	I	18.94 \pm 14.80
	III	15.0 \pm 3.30
Height of Symphyseal	I	10.0 \pm 3.0
	III	7.21 \pm 2.51

The below table shows the incisor inclination in all three facial categories belonging to vertical classes I and III. Class I comprises 8 patients and class III comprises 10 patients. Three different types of incisor inclinations were observed that is overjet positive, overjet negative, and edge to edge.

Table 2: Sample segregation in various classes

Facial category	Classes	Incisor inclination
Long (n = 2)	I (n = 8)	Overjet positive (n = 8)
Normal (n = 3)		
Short (n = 3)		
Long (n = 3)	III (n = 10)	Overjet positive (n = 4) Overjet negative (n = 4) Edge to edge (n = 2)
Normal (n = 2)		
Short (n = 5)		

Then, the comparison of various angles was done with vertical classes. At higher angles, increased Symphyseal height was observed and it is comparatively lower in the case of moderate angles. After statistical analyses, the standard deviation and p-value show a significant difference between higher and moderate angles. The standard deviation and average value differences were also significant in the case of the width of growth patterns.

Table 3: Comparison of various parameters with vertical growth

	Vertical class	Comparative Classes	Standard deviation	p-value
Inclination of incisors	Lower angle	Moderate angle	2.510	0.481
		Higher angle	4.380	0.083
	Moderate angle	Higher angle	2.101	0.623
Width of Symphyseal	Lower angle	Moderate angle	1.500	0.002
		Higher angle	2.830	0.0
	Moderate angle	Higher angle	1.321	0.002
Height of Symphyseal	Lower angle	Moderate angle	-1.508	0.623
		Higher angle	-5.023	0.002
	Moderate angle	Higher angle	-3.198	0.134

DISCUSSION

The morphology of mandibular symphysis gives information about the orthodontic movements that can be done within the safe range. So before treatment, it is necessary to diagnose soft tissues surrounding the teeth¹². In this study, pre-treatment cortical dimensions of symphysis were done in relation to the inclination of incisors. Two Different classes of vertical growth dimensions were compared with sagittal growth angles, like high, moderate, and lower angles.

About 18 patients participated in this study belonging to two vertical classes I and III. 8 patients were from class I and 10 patients from vertical class III. The examined dimensions were from the root apex and the width was measured from the occlusal plane. All the patients who participated in this study have aged more than 18 years and have complete growth of the mandible. In a study of the symphysis, different scales of measurement were used to calculate the vertical growth in relation to the inclination of incisors. Then 3-D radiography¹³⁻¹⁵ was used for further analyses, this study is not similar to the respective study but some points were comparable like the symphyseal height is relative to the inclination of incisors. But in our case, it is only true with vertical class I. However, much difference was observed in the case of class III. In the case of class III, the inclination of incisors was observed with the lower symphyseal height. However, a very small difference in the dimension of the mandible was observed in the case of class I, as compared to class III. The inclination of the incisor was retroclined and proclined in the case of class III, which shows a compensatory method for the stabilization of occlusion. Further analysis revealed that higher angles of vertical growth lead to a long narrow valley like symphysis. However, in normal and low-angle patients no such situation was observed. For the validation of variables like facial shape and different vertical classes, PCA was used. It helps in the estimation of differences between long, short, and average facial patterns and their comparative bone modeling. With the help of it, the inclination of incisors in three of the facial patterns was calculated within a safer range before and after treatment. Our results were quite similar to a study claiming that a thin alveolar layer is often bumped into patients having proclination and small facial patterns. There exist a relationship between the inclination of incisors specifically lower incisors and the width and height of symphysis and it is also related to facial growth patterns. The low angle facial patients have symphysis with more width and lower height which is the opposite in other cases. In the case of higher angle¹⁶⁻¹⁸ facial patients, the symphysis is narrowed and long. Some other studies also support this hypothesis that, the smaller the facial angle, the smaller the height, and the more width the symphysis. If more inclination of incisors occurs, it may lead to the damage of soft tissues around the teeth and other damage to the periodontics.¹⁹⁻²⁰ In the case of the thin symphysis, there is a risk of bone dehiscence. In such cases, the bone is removed before doing the inclination of lower incisors. There is one drawback in the inclination of lower incisors in patients having high angle facial patterns. Actually, the capability of lower incisor movement is restricted in patients having higher angle facial patterns as compared to lower and average angle facial. So, in these patients, it is not easy to incline lower incisors. The inclination can be done up to a limit in such patients.

However, in all patients, it is necessary to avoid over inclination of incisors because it may lead to dentine damage, resorption of bones, iatrogenic issues, and dehiscence. So, it is mandatory to be within biological limits or the movement of teeth within a safe range, otherwise, it may cause serious issues to mandibular bone. For the analysis of inclination and mandibular bone state, 2D radiography is usually done before and after treatment of incisors inclination, but for further elaborated study of facial angles X-ray study is also employed. For a more accurate estimation of dimensions, lateral cephalograms are better.²¹⁻²²

CONCLUSION

From this study, it is predicted that a correlation exists between vertical growth patterns and sagittal growth patterns for the inclination in incisors. The height and width of the symphysis and facial patterns are also related to vertical growth patterns and indirectly affect the inclination of incisors. High angle facials have thin and long symphysis, while low angle facials have thick and short symphysis. Vertical Class I show proclined incisors (lower) while class III shows retroclined incisors. For the inclination of incisors, biological limits are also employed. Beyond biological

limits, serious dentine issues may raise lead to mandibular desorption and damage to the tissues.

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