



Correlation Between Gonial Angle and Mandibular Symphysis Width in South Indian Dravidian Population

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ABSTRACT

Mandibular growth pattern (MGP) prediction plays an important role in orthodontic treatment planning. This study sought to assess the mandibular symphyseal width in adolescents with different mandibular growth patterns (MGPs) so as to see whether a correlation exists. This study was conducted on 90 lateral cephalograms of patients aged between 10 and 16 years. The subjects were divided into normo-divergent, hypodivergent and hyperdivergent subgroups based on the gonial angle. The symphyseal measurement included width or depth of the mandibular symphysis according to Akietai study. He suggested that a mandible with anterior growth direction was associated with a large depth of the symphysis. In contrast, a mandible with a posterior growth direction was associated with a small depth of symphysis. To assess the correlation between mandibular symphyseal width and mandibular growth pattern, Pearson's correlation test was done. Correlation is significant at the 0.01 level (2 tailed). A P-value which is less than 0.05 was considered statistically significant. The mandibular symphyseal width was found to be strongly associated with the MGP. It can be inferred from the results that in vertical growth pattern, as the gonial angle increases, symphyseal width decreases and in horizontal growth pattern, as the gonial angle decreases, symphyseal width increases. Also, in vertical growth pattern subjects, the mandibular symphyseal width is narrower. In contrast, in horizontal growth pattern subjects, the mandibular symphyseal width is wider.

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INTRODUCTION

In orthodontic treatment planning, mandibular growth pattern (MGP) prediction plays an important role (Huggare, 1989). Till date, different methods have been used in the prediction of mandibular growth. The mandibular growth pattern is of deep concern to the clinician because it significantly alters the need for orthodontic biomechanics. The treatment plan varies in hyperdivergent and hypodivergent facial types. So a reliable method of growth pattern prediction is inevitable to the orthodontists for diagnosis, treatment and to decide on biomechanics.

With the introduction of radiographic cephalometry, it became easier to determine the various

mandibular growth patterns. Literatures suggest that the morphology of natural reference structures is reliable and accurate for cephalometric research (Björk, 1969).

In orthodontics, the prediction of mandibular growth is necessary for diagnosis and treatment planning and also in the development of balanced dentofacial structures. Previous investigators assessed a variety of methods to predict mandibular growth. Also, they used a variety of parameters (Rubika et al., 2015).

Aki et al. (Aki et al., 1994) suggested that the morphology of the symphysis was found to be associated with the direction of mandibular growth. He suggested that a mandible with anterior growth direction was associated with a large depth of the symphysis. In contrast, a mandible with a posterior growth direction was associated with a small depth of symphysis.

The purpose of this study was to Evaluate the symphyseal morphology (symphyseal width or depth) in patients aged between 10 and 16 years with different mandibular growth patterns.

MATERIALS AND METHODS

Lateral cephalometric radiographs of patients ages between 10 and 16 years were evaluated in this study. The study was conducted on lateral cephalograms of 90 subjects. Selection criteria for normo-divergent groups include; Angle's class I molar relationship, overjet and overbite within normal limits, no history of decayed, missing, filled teeth, no history of previous orthodontic treatment, no facial asymmetry. Selection criteria for hyperdivergent and hypodivergent study groups include; no history of previous orthodontic treatment, no facial asymmetry, class I or II molar relationship, presence of all permanent teeth. Samples were selected from the patients referred to the Department of Orthodontics of Saveetha Dental College, Chennai. Subjects are divided into vertical, horizontal and average growth patterns based on the gonial angle. There are 30 subjects in each group of vertical, average and horizontal growth patterns. All radiographs were taken with the same radiographic device. All of them were digitized. The measurements were made using Facad software. The symphyseal measurements included the width or depth of the mandibular symphysis, according to Aki et al. study (Aki et al., 1994) (Figure 1).

Statistical Analysis

The collected data are entered into an Excel sheet (Microsoft Excel 2007) and statistical analysis done

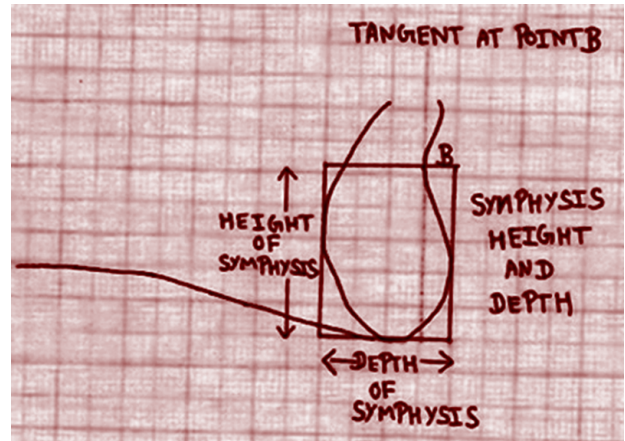


Figure 1: Cephalometric measurements used to quantify symphysis morphology.

using IBM SPSS software. To assess the relation between mandibular symphyseal width and mandibular growth patterns; Pearson's correlation test was done.

RESULTS AND DISCUSSION

Comparison of each group showed a positive correlation between the symphyseal width and average mandibular growth pattern whereas, negative correlation in vertical and horizontal growth patterns (Table 2). The horizontal growth pattern of mandible showed wider symphysis menti; in contrast, vertical growth pattern has a lower width of mandibular symphysis (Table 1).

The size and shape of the mandibular symphysis is an important consideration in the evaluation of orthodontic patients. Different methods have been used for the assessment of mandibular growth patterns (Spady et al., 1992; Liu et al., 2010). In previous literature, morphological changes in the mandibular body have been studied and it was found that mandibular body length had a linear correlation with gonial angle (Ogawa and Osato, 2013).

Aki et al. (Aki et al., 1994) introduced a recent method for the prediction of mandibular growth pattern by assessing the symphyseal morphology. In the case of the symphysis, it is easy to select landmarks for assessing the morphology in cephalograms. So these measurements were used to evaluate their variation in three different mandibular growth patterns.

Morphology of symphysis differed significantly between average growth patterns and other growth patterns. It was noticed that with the horizontal growth pattern of the mandible, the width of the mandibular symphysis is wider. In cases with vertical growth patterns, the width of the mandibular

Table 1: Mean and standard deviations of mandibular symphyseal width and gonial angle of average, vertical and horizontal mandibular growth patterns.

Group	Mean symphyseal width	SD	Mean Gonial angle	SD
1. Average growth pattern	13.42	1.46	127.03	1.72
2. Vertical growth pattern	9.19	1.48	132.96	1.75
3. Horizontal growth pattern	15.15	1.43	118.03	1.70

Table 2: Table depicts Pearson's correlation between gonial angle and symphyseal width in vertical, average and horizontal growth patterns.

Group	Pearson's correlation value	Significance(2-tailed)
1. Correlation between gonial angle and symphyseal width in vertical growth pattern	-0.118	0.542
2. Correlation between gonial angle and symphyseal width in average growth pattern	0.352	0.057
3. Correlation between gonial angle and symphyseal width in horizontal growth pattern	-0.272	0.146

symphysis is narrower. Depth of the symphysis increased from vertical growth to horizontal growth in the mandible. The size and shape of the mandibular symphysis is an important consideration in the evaluation of orthodontic patients (Forster *et al.*, 2008; Wagner and Chung, 2005). More protrusion of the incisors is esthetically acceptable with a prominent symphysis. Therefore a greater chance of non-extraction protocol (Lee, 1987). This concept is acceptable since it is confirmed in our present study. Therefore we can do a non-extraction treatment approach in a horizontally growing individual. In vertical growth patterns, it is better to extract the teeth and proceed with the treatment.

Aki *et al.* (Aki *et al.*, 1994) did a study to determine whether symphysis morphology can be used for the assessment of mandibular growth pattern. A mandible with vertical growth pattern had a narrow symphyseal width. Conversely; horizontal growth pattern had a wider mandibular symphysis. Gonial angle was found to be significantly increased in hyperdivergent group when compared to hypodivergent and normo-divergent groups. Many investigators Jensen (Nanda, 1990), Scendel (Schendel *et al.*, 1976) indicated that the obtuse gonial angle is associated with a skeletal open bite while the small gonial angle is associated with a deep bite.

Mandibular symphyseal depth was found to be increased in horizontal growth pattern and average growth patterns when compared with verti-

cal growth pattern subjects. These results were in agreement with studies of Hellman (Isaacson, 1971; Posnick, 2013) and Sassouni (Isaacson, 1971).

CONCLUSION

In vertical growth pattern subjects, the mandibular symphyseal width is narrower. In contrast, in horizontal growth pattern subjects, the mandibular symphyseal width is wider. Gonial angle values are greater in vertical growth pattern subjects. To conclude; symphyseal depth differed significantly in vertical and horizontal growth patterns in comparison with normal-divergent groups.

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Conflict of Interest

The authors declare that there is no potential conflict of interest.

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