

Mandibular symphysis height based on gender in cephalometric radiographs

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Abstract

Cephalometric radiography is an examination method that often used in orthodontic treatment to make a diagnosis which includes the relationship of teeth to jaw, assessment of skeletal relationships, assessment of dental relationships and functional analysis. This study aims to determine the height of the mandibular symphysis through cephalometric radiographic based on gender. This study aims to determine the height of the mandibular symphysis by gender from cephalometric radiographic picture. This research is using analytic observational design. The research data used 70 secondary data cephalometric radiograph of RSKGMP Airlangga University patients. The data was measured manually by forming a line parallel and perpendicular to the line tangent to point B, and calculating the distance between the superior border of the mandibular symphysis taken at point B to the most inferior border of the symphysis outline. The average value of the mandibular symphysis height in males is 22.44 mm and in females is 20.53 mm. There is a significant difference in the height of the mandibular symphysis in males and females.

Keywords: Cephalometric radiography; Gender; Mandibular symphysis; Height

1. Introduction

Various tools and examination methods have been found in dentistry. Especially in radiology, there are several types of examination methods such as X-ray, USG (Ultrasonography), CT (Computed Tomography) scanners, and radiography¹. Radiography is a method of examination using ionizing rays to form an image of the object being studied on the film. Radiography is divided into two types, extraoral radiography and intraoral radiography. The types of extraoral radiography are panoramic radiography, cephalometric radiography, lateral jaw radiography, and others.² Cephalometric radiography is the examination method most often used by dentists in orthodontic treatment to help diagnose which includes tooth-jaw relationships, assessment of skeletal relationships, assessment of dental relationships and functional analysis^{2,3,4}. The results of cephalometric radiographic images can be seen the relationship between the teeth, craniofacial structures and the condition of the maxilla and mandible.⁵

Skull bones can be an accurate gender identification tool to help identify disaster victims. The accuracy rate for determining gender using skull bones is 90%.⁶ Among the skull bones, there is the mandible which plays an important role in determining gender. The mandible is the largest and strongest bone in the skull bone and resistant to decomposition^{7,8}.

Besides being useful for determining gender, the mandible also plays a role in orthodontic treatment. There is an anatomical part of the mandible that has an important role in orthodontic treatment, namely the mandibular symphysis. The size and shape of the mandibular symphysis are important considerations in the evaluation of patients in orthodontic treatment⁹.

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The mandibular symphysis is part of the mandibular anatomical structure which is located in the frontal midline of the mandible, forming the chin and the front of the lower face. Human has a different shape of the mandibular symphysis. These differences can be influenced by the functional environment, masseter muscle thickness, mandibular plane angle, mandibular incisor angle, nutrition, hormones, trauma, heredity and gender¹⁰⁻¹³.

2. Material and methods

This type of research is an analytic observational using 35 male and 35 female samples. Samples were obtained from RSKGMP Airlangga University during the period 2018-2022 and were taken using the Lemeshow method. The sample in this study must fulfill the inclusion and exclusion criteria. The inclusion criteria consisted of male and female, aged 15-35 years, the mandibular incisors are still complete and the cephalometric radiographic data in a good quality. The exclusion criteria consisted of the sample had experienced a fracture of the symphysis and anatomical abnormalities in the mandibular symphysis. This study protocol was approved by Universitas Airlangga Dental Hospital Ethical Committee, Surabaya, Indonesia (28/UN3.9.3/Etik/PT/2022).

The samples were measured manually using the Aki method (1994) by forming a line parallel and perpendicular to the line tangent to point B, and calculating the distance between the superior border of the mandibular symphysis taken at point B to the most inferior border of the symphysis outline.

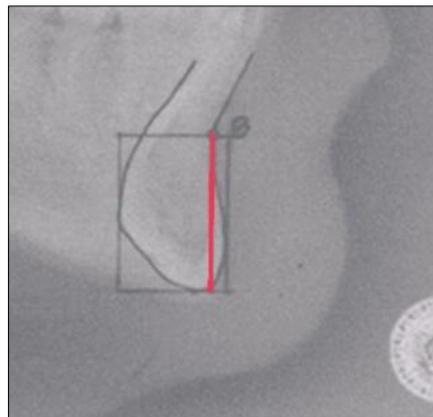


Figure 1 The measurements of symphysis height

Data that has been obtained from three observers, a reliability test is carried out to find out to what extent the measurement results using the same object will produce the same data. Because this research was conducted by three observers, a reliability test was carried out using the Interclass Correlation Coefficient test. Then the data were analyzed using Statistical Program for Social Sciences (SPSS) normality test was performed using the Shapiro-Wilk Test to determine the distribution of the data. If the data were normally distributed, a parametric statistical test was using the independent T test to compare the average mandibular symphysis height based on male and female. And if the data distribution in this study is found to be abnormal, then a non-parametric statistical test is performed with the Mann Whitney test

3. Results

Based on the results of measurements by three observers, the average mandibular symphysis height in males is 22.44 mm. While the average mandibular symphysis height in women is 20.53 mm and the significance test showed $p < 0.05$. This means that there are differences in the size of the mandibular symphysis height based on gender. (Table 1)

Table 1 Mandibular symphysis height in males and males

| Assessment | Total | Mean (Males) | Total | Mean (Females) | p |
|-----------------------------|-------|--------------|-------|----------------|--------|
| Mandibular Symphysis Height | 35 | 22.44 | 35 | 20.53 | 0.004* |

*significance

4. Discussion

The aim of this study is to determine the differences of mandibular symphysis height in males and females based on lateral cephalometric radiographic features. This difference is influenced by several factors, one of them is gender. Males have a greater opportunity for mandibular growth and development compared to females. This is caused by the adolescent growth spurt that is owned by male, and they have an additional two years in the process of growth and development¹⁴. In addition, sex hormones are also very influential in determining the development of a human's face. Sex hormone increases the secretion of growth hormone (GH). GH is released in large quantities and it is associated with growth spurts, where growth spurts contribute 17% of male adult height and 12% of female adult height¹⁵. This statement is supported by the results of a study by Aki et al (1994), using samples aged 17-30 years by measuring the height of the mandibular symphysis using cephalometric radiography and obtained an average of 25.91 mm in males and 23.18 mm in females.

This study was conducted to provide information that the mandibular symphysis on cephalometric radiography can be used as a supporting examination useful for dentists in orthodontic treatment to see the direction of mandibular growth. The mandibular symphysis plays a role in the composition and harmony balance of the face. In addition, the morphology of the mandibular symphysis affects treatment plans and assists in diagnosis in orthodontic examination¹⁴. Based on the research of Aki et al (1994) the morphology of the mandibular symphysis was found to be related to the growth direction of the mandible. The relationship between height, width and angulation of the mandibular symphysis affects the assessment of mandibular growth. Mandibles with an anterior growth direction usually have a hypodivergent facial pattern with short symphyseal height, large width, small ratio, large symphyseal angle and wide chin. Meanwhile for the posterior growth direction with a hyperdivergent facial pattern, it has a long symphysis height, small width, large ratio, small symphyseal angle, and narrow chin¹⁶. Mandibular growth can help diagnose orthodontics and treatment plans such as treatment duration, tool selection, extraction sequence and extraction needs¹⁷.

The hypodivergent pattern is characterized by a short face and a tendency for the teeth to grow buccally. The hyperdivergent pattern has a tendency to form a narrow jaw arch, it causes malrelation and malposition of teeth.¹⁸ Humans with short symphysis generally have a wide chin so that more incisor protrusion is aesthetically acceptable and therefore the possibility of treatment is greater in the non-extraction direction¹⁹. Whereas for humans with a higher symphysis and a narrow chin, the possibility of a treatment plan is towards extraction²⁰.

5. Conclusion

There is a significant difference in the height of the mandibular symphysis in males and females. Mandibular symphysis in males is higher than females. With mean value of 22.44 mm in males and 20.53 mm in females.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

Statement of ethical approval

This study protocol was approved by Universitas Airlangga Dental Hospital Ethical Committee, Surabaya (28/UN3.9.3/Etik/PT/2022).

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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