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Gender Determination by Pantomographic Analysis of Mental Foramen

Preethi Shankar[1], Dr. Reshma Poothakulath Krishnan[2],Dr Abirami Arthanari[3]

[1]Undergraduate student, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS) Saveetha University Chennai - 600 077, Tamil Nadu, India

[2]Senior Lecturer , Department of Oral Pathology, Saveetha Institute of Medical and Technical Sciences (SIMATS) , Saveetha University, Chennai - 600 077, Tamil Nadu, India

[3]Lecturer, Department of Oral Pathology, Saveetha Institute of Medical and Technical Sciences (SIMATS) , Saveetha University, Chennai - 600 077, Tamil Nadu, India

***Corresponding author**: Dr. Reshma Poothakulath Krishnan, Senior Lecturer , Department of Oral Pathology, Saveetha Institute of Medical and Technical Sciences (SIMATS) , Saveetha University, Chennai - 600 077, Tamil Nadu, India , Email : reshmapk.sdc@saveetha.com

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ABSTRACT

Introduction: Panoramic radiography, also called panoramic x-ray, is a two-dimensional dental x-ray examination which enables the capture of the entire mouth in a single image, including the teeth, upper and lower jaws, surrounding structures and tissues. Orthopantomography radiographs are used by oral surgeons to plan treatment for dentures, braces, extractions and implants. The mental foramen is one of two foramina situated on the anterior surface of the mandible. It transmits the terminal branches of the inferior alveolar nerve and vessels. The aim of the study is to evaluate the gender differences from the distances from superior border of mental foramen and inferior border of mental foramen to the lower border of mandible.

Materials And Methods: 20 OPGs were collected and the distance from the superior and inferior border of the foramen to the lower border of mandible was measured and the results were analysed.The graphs were plotted in SPSS.

Results: The values of distance from the superior and inferior border of the mental foramen to the lower border of mandible were found to be higher in males compared to females. On comparing and applying independent t-test for both the genders, the p was found to be 0.543 which is not statistically significant ($p < 0.05$).

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Conclusion: Mental foramen values were found to be higher in males than the females. Mental foramen can be used as a diagnostic tool in gender determination. This technique is of high importance during mass disasters for identification of unknown persons.

Keywords: *Mental foramen, gender determination, mandible, diagnostic tool, orthopantomogram, innovative technology, novel method.*

INTRODUCTION

Forensic medicine deals with an area of endeavor that can be used in a judicial setting. It is accepted by the court and general scientific community, to separate truth from the untruth. Forensic odontology is the handling, examination and evaluation of dental evidence in criminal judicial cases. It is of most helpful means in identification of unknown persons during mass disaster (1). The pelvis and the skull are the most reliable source for gender discrimination. In absence of pelvis, the mandible can be used for determination (2). Mandible is the most durable facial bone which retains its shape better than the rest of the bones. Mandible is one of the facial bones that can be used as a tool which is used in the determination of gender. In mandible, bigonal breath, ramus and mental foramen are used for the gender discrimination (3).

The mental foramen is one of the two foramina located on the anterior surface of the mandible. It transmits the terminal branch of the inferior alveolar nerve and vessels. It is located on the buccal cortex of the mandibular bone (4). Mental nerve, emerges from mental foramen, is a sensory nerve which provides sensation to the front part of the chin and lower lip and also to the labial gingival of the mandibular anterior teeth and premolars. Mental foramen descends slightly on toothless individuals. Mental foramen serves as an important anatomical landmark, the orientation and position of which facilitate surgical, local anesthetic and other invasive procedures for oral and maxillofacial surgeries (5).

Knowledge on the anatomy of this region is essential for performing effective nerve blocks, and avoiding injuries to the neurovascular bundles (6). Mental foramen can also help in identifying the age of an individual. The position of mental foramen might slightly vary in different genders.

Orthopantomogram is a panoramic scanning dental X-ray of the upper and lower jaw. It demonstrates the number, position and growth of all teeth including the non-erupted teeth (7). By comparing the superior border, inferior border of mental foramen and lower border of the mandible the gender discrimination can be determined (8). Our team has extensive knowledge and research experience that has translate into high quality publications (9),(10),(11),(12),(13),(14),(15),(16),(17),(18),(19),(20),(21),(22),(23),(24),(25),(26),(27),(28).The aim of the study is to evaluate gender differences from the distances from superior border of mental foramen and inferior border of mental foramen to the lower border of mandible.

MATERIALS AND METHODS

20 OPGs were collected from Saveetha dental college and hospitals consisting of 10 Female OPGs and 10 Male OPGs. A retrospective study was conducted on panoramic radiographs of the patients aged between 30-40 years was acquired for orthodontic and endodontic requirements. High quality radiographs with correct positioning were only included in the study. The radiographs with distortion of images, presence of artefacts, surgical intervention and non-visualisation of mental foramen were excluded.

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A computerised software was used to determine the measurement. The tangents were drawn from the superior and inferior border of the mental foramen and perpendicular were drawn to the tangents to the lower border of the mandible bilaterally. The distance was measured from the superior border and inferior border of the mental foramen to the lower border of the mandible (Figure 1). Data was tabulated and analysed using SPSS Software.

FIGURE 1: Distance measured from the inferior border of mental foramen to the lower border of mandible in an orthopantomograph.

RESULTS

In the present study, the mean distance from the superior border of mental foramen to the lower border of mandible was higher in males (21.2500) than females (15.7200). On comparing and applying independent t-test for both the genders, the p was found to be 0.620 which is not statistically significant ($p < 0.05$). Similarly the mean distance from the inferior border of the mental foramen to the lower border of the mandible was higher in males (17.7700) than females (12.5500). On comparing and applying independent t-test for both the genders, the p was found to be 0.543 which is not statistically significant ($p < 0.05$).The vertical distance from the superior and inferior border of mental foramen to the lower border of mandible is found to be higher in males than that of females (Figure 2 and 3).

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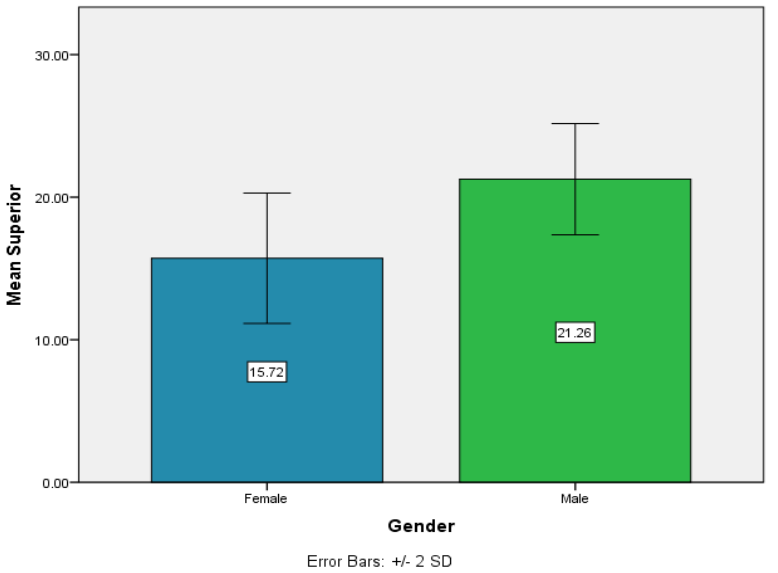

FIGURE 2: The bar graph depicts the mean value of the distance from the superior border of mental foramen to the lower border of mandible on females and males respectively. X axis represents the gender and Y axis represents the distance from the mental foramen. Blue denotes the mean distance from the superior border of mental foramen to the lower border of mandible in female and green colour denotes the mean distance from the superior border of mental foramen to the lower border of mandible in male. The distance from the superior border to the lower border of mandible was more in males when compared to females. Independent t-test shows p value of 0.543 which is not statistically significant ($p < 0.05$).

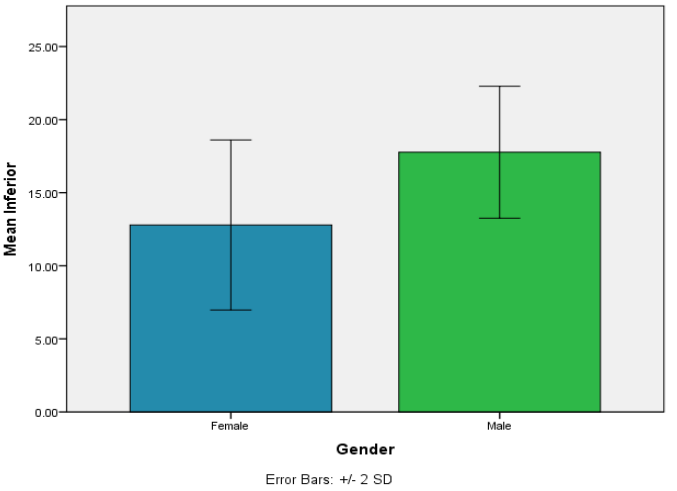

FIGURE 3: The bar graph depicts the mean value of the distance from the inferior border of mental foramen to the lower border of mandible on females and males respectively. X axis represents the gender and Y axis represents the distance from the mental foramen. Blue denotes the mean distance from the inferior border of mental foramen to the lower border of mandible in female and green colour denotes the mean distance from the inferior border of mental foramen to the lower border of mandible in males. The distance from the inferior border to the lower border of mandible was more in males when compared to females. Independent t-test shows p value of 0.624 which is not statistically significant ($p < 0.05$).

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DISCUSSION

The mandible is considered as the strongest bone in the human body and its features are helpful in distinguishing between gender. Characteristics of mandibles are used by anthropologists and forensic dentists in a determination of gender. Presence of a dense layer of a compact bone makes it durable and easy for identification. Mental foramen is located on the anterior surface of the mandible, between first and second mandibular teeth.Morphological dimensions of the foramen can be assessed easily from panoramic radiographs. Panoramic radiographs help in providing the image of both the jaws in a single film with a small dosage of radiation with lower cost.The position of mental foramen changes during primary dentition and remains stable during the eruption of the primary and mixed dentitions. The study of Wical and Swoope states that in spite of the resorption of the alveolar bone above the mental foramen, the distance from the mental foramen to the inferior border of the mandible is constant throughout our lives(29) .

The current study states that the vertical distance from the superior and inferior borders of mental foramen is higher in males than that of females. The study concludes that the mental foramen of the mandible exhibit sexual dimorphism (30). The study of Akilesh, Rohit etal. concludes that the distances from the mental foramen to the lower border of the mandible exhibit sexual dimorphism. On the contrary, the study of Vodanovic etal states that distance from superior and inferior border of foramen to the mandible does not exhibit sexual dimorphism. The varying measurements in each individual is due to racial diversity (31). Another study states that Males have a significantly higher value in vertical distance from superior border of alveolar ridge to the inferior border of the mandible and vertical distance from superior border of alveolar ridge to the superior border of mental foramen.

The study concludes that there is a change in position of mental foramen between males and females (32). Due to the stronger muscles and greater bite force of men results in more deposition of bone along the lower border of the mandible. Various forces of masticatory muscles and hormones are the reason for the difference in the height of mandibular basal bone. Limitations of this study include less sample size and homogenous population. From this study it can be concluded that mental foramen can be used as a diagnostic tool in gender determination. This technique is of high importance during mass disasters for identification of unknown persons.

CONCLUSION

Based on the finding, the study concluded that the mental foramen situated in the mandible can be used as a diagnostic tool for gender determination. The distance from the superior and inferior border of the mental foramen to the lower border of mandibles, males had higher values than females. The technique of using mental foramen in gender determination can be used in mass disasters for identification of the person.

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CONFLICT OF INTEREST

The authors have none to declare.

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