
POSITION OF THE MENTAL FORAMEN IN CORELATION WITH THE LOWER PREMOLARS: A PANORAMIC RADIOGRAPHIC STUDY

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Abstract: Background: Evaluation of the position of foramen mentale has great significance and it is very important aids in endodontic, oral-surgical, periodontal interventions, as well as diagnostic procedures. Thus, in view of this, the present study was conducted among the population in North Macedonia, to determine the most common location of the mental foramen and to estimate difference in position of foramen mentale in correlation with the second lower premolar teeth. The mental foramen is an opening located on the external surface of the mandible in the region of the mandibular premolars. Radiographically the foramen mentale can be as an oval or round radiolucent zone in the inferior part of corpus mandible on lateral sides, on the left and right side. Panoramic radiographs are the most commonly used extra-oral radiographic aids in dentistry since they provide a rapid and wide picture of mandible and the maxilla in the same time. This technique allows the adequate localization of foramen mentale. The main aim of study is to evaluate the position of the mental foramen and its relationship with mandibular premolars among the population in Republic of North Macedonia

Material and method: A total number of 250 panoramic radiographs were evaluated for the positioning of the mental foramen. When assessing the position of the mental foramen, its position is determined in relation with the mandibular premolars and the mandibular median line. All radiographic images in which can not be localized and confirmed the presence of the mental aperture was also excluded from the examination. The examination was performed on a negatoscope if it is classical panoramic x-ray or adequate software used for digital panoramic x-rays. If necessary, magnification was used for magnification of the images. The relationship of foramen mentale with the lower premolars was given according to the following classification: (1) if the position of foramen mentale is distally from the line that passes between the second premolar and the first molar in the lower jaw-first class; (2) if the position of foramen mentale is between the vertical central axis of the second premolar and the passing line between the second premolar and the first molar in the lower jaw- second class; (3) if the position of the foramen mentale is between the vertical axis of the second premolar and the line passing between the first and second premolars in the lower jaw- third class; (4) if the position of foramen mentale is between the line that passes between the first and second premolars in the lower jaw and the vertical central axis of the first premolar-fourth class and if the position of foramen mentale is mesially from the vertical center axis of the first premolar- fifth class. Results: On the basis of the data from our research, it is noted that in near 60%, foramen mentale is positioned between the roots of the first and second lower premolars. The most common position for foramen mentale is the third class (which means that foramen mentale is between the vertical axis of the second premolar and the line passing between the first and second premolars in the lower jaw).

Conclusion: In conclusion, the present results showed variations in position of foramen mentale. So it must be noted that local differences in foramen mentale position may occur in a population. This variability should alert the oral surgeons while performing oral surgical and periodontal interventions. If the studies related to variations in the position of foramen mentale are carried out in larger numbers, this data will be reliable for dental medicine clinicians, and with this type of information the possibility of complications will be minimized.

Keywords: foramen mentale, mental foramen, Ortodontomogram, panoramic x-ray

INTRODUCTION

Evaluation of the position of foramen mentale has great significance and it is very important aids in endodontic, oral-surgical, periodontal interventions, as well as diagnostic procedures. Thus, in view of this, the present study was conducted among the population in North Macedonia, to determine the most common localization of the

mental foramen and to estimate difference in position of foramen mentale in correlation with the second lower premolar.

The mental foramen is an opening located on the external surface of the mandible in the region of the mandibular premolars. The inferior alveolar blood vessels and nerve after being conveyed through the mandibular canal exit as the mental blood vessels and nerve. This nerve is responsible for innervating the lower lip, labial mucoperiosteum of the lower incisors, canine and premolars as well as the mental region.

The position of the foramen is of significant importance in procedures of local anesthesia of the terminal branches of the inferior alveolar nerve together with the mental nerve. In clinical practice, anaesthesia of these nerves could be effectively obtained just if the mental foramen is adequately located by the clinician and the anesthetic solution dropped within it.[1] It is also a very important structure for evaluation of the maturity of the lower jaw, placement of dental implants, remodeling activity of the bone.[2]

Normally, mental foramen is located below the interval between the lower premolars. However, variations in the location of the foramen have been reported. It most common lie between the apices of lower premolars or below the apex of second premolar.[3]

According to Bello et al.,[4] most of the analyzed foramina were horizontally positioned between the mandibular first and second premolars (65.9%) and vertically positioned higher than 2 mm below the apex of the second mandibular premolars. Srinivas et al in their research noted that the most common position of the foramen mentale was along the long axis of the second premolar in the north Indian population and in southern Indian populations it was found to be between the first and second premolar.[5] According to Cartes et al.[6] foramen mentale is usually located between the apices of the first and second premolars in younger individuals and immediately below the apex of the inferior second premolar in older individuals. Similar to previously presented data, Curie et al.[7] showed that the most common position for foramen mental is between the first and second premolar teeth when using both premolar crowns (51%) and apices (76%) as reference points.

Radiographically the foramen mentale can be seen as an oval or round radiolucent zone in the inferior part of corpus mandible on lateral sides, on the left and right side. Panoramic radiographs are the most commonly used extraoral radiographic aids in dentistry since they provide a rapid and wide picture of mandible and the maxilla in the same time. This technique allows the adequate localization of foramen mentale. This easy determination of foramen mentale is most often used. The retroalveolar x-rays can not serve for determination of foramen mentale position. That is due to the oblique path of the mental canal and it is difficult to identify foramen mentale consistently on intra oral radiography.

The main aim of study is to evaluate the position of the foramen mentale and its relationship with mandibular premolars among the population in Republic of North Macedonia.

MATERIAL AND METHOD

A total number of 250 panoramic radiographs were evaluated for the positioning assessment of the foramen mentale. The number of male and female examinees was equal. Evaluation of the positioning of the foramen mentale will not be performed in completely toothless individuals. This investigation was including digital and classical panoramic x-rays of both jaws.

For complete and correct evaluation, the following conditions must be fulfilled by the panoramic x-ray to be included in this investigation:

- High quality and contrast
- Absence of artefacts in the area of foramen mentale
- Appropriate angulation of the x-rays
- The presence of teeth from the left first to the right first molar (to avoid the possibility of dental migration)
- Absence of periapical changes of teeth in the premolar region (which can be wrongly interpreted as foramen mentale)
- Presence of premolars in the upper jaw to avoid elongation of the premolars from the lower jaw
- Patients should not be under orthodontic treatment

All radiographic images in which can not be localized and confirmed the presence of the mental aperture was also excluded from the examination.

The examination will be performed on a negatoscope if it is classical panoramic x-ray or adequate software used for digital panoramic x-rays. If necessary, magnification was used for magnification of the images.

Assessment of the presence of foramen mentale and its relation with the adjacent structures and the mandibular canal will be made of three independent examiners, including the main examiner. During the research were include different profiles of researchers, doctors of general medicine and doctors of dental medicine.

When assessing the position of the mental channel, its position is determined in relation with the mandibular premolars and the mandibular median line.

The relationship of foramen mentale with the lower premolars will be given according to the following classification:

- The position of foramen mentale is distally from the line that passes between the second premolar and the first molar in the lower jaw- first class
- The position of foramen mentale is between the vertical central axis of the second premolar and the passing line between the second premolar and the first molar in the lower jaw- second class
- Position of the foramen mentale is between the vertical axis of the second premolar and the line passing between the first and second premolars in the lower jaw- third class
- The position of foramen mentale is between the line that passes between the first and second premolars in the lower jaw and the vertical central axis of the first premolar- fourth class
- Positional position of foramen mentale is mesially from the vertical center axis of the first premolar- fifth class

In these cases foramen mentale can be localized above or in line with the apex of the premolars from the lower jaw or between the apexes of both premolars.

RESULTS

In the section that follows through tables analyzed data from the survey are presented. Table number 1 presents the data referring to the positioning of foramen mentale in relation to the two lower premolars, if it is under the first or under the second premolar or the openings is located between these two teeth.

Under first premolar	Between two premolars	Under second premolar
14.8 %	58.4 %	26.8 %

Tab. No. 1. Position of foramen mentale in correlation with the mandibular premolars

The table below (Table No. 2) presents the data referring to the position of the mandibular canal according to the previously presented mandibular channel positioning classes (in material and method).

	Total
First class	3.22 %
Second class	16.13 %
Third class	43.55 %
Fourth class	25.81 %
Fifth class	11.23 %

Tab. No. 2. Position of foramen mentale in correlation with the mandibular premolars according to the different classes of positioning

Based on the presented results, it can be noted that the most common localization of foramen mentale is between the two lower premolars, while the remaining positions are rare.

Also, after statistic processing, no significant difference was observed of the different positions of foramen mentale in the male and female subjects (for $p < 0.005$).

DISCUSSION

The primary aim of this study was to determine the position of the foramen mentale in relation with the two lower premolars, using dental panoramic radiographs. In order to compare the results of this study with existing data, the position of foramen mentale was also determined according to the five different classes of positioning of foramen mentale, explained earlier in the text.

The knowledge of the various possible localizations of mental foramen is important and it is helpful to avoid damage to the mental nerve in different oral surgical procedures, aids in interpreting anatomical landmarks in oral pathology and radiology and it is important for dental implant planning and placing. Understanding the position of these foramina will also assist the clinician in performing local anesthetic blocks while some oral or periodontal surgical techniques are performing.

According to this, adequate determination of the radiographic position and features of the foramen mentale in particular is much needed in order to corroborate anatomic descriptions that were made in past times and also to reduce or eliminate the possibility of complications during the interventions.

On the basis of the data from our research, it is noted that in near 60%, foramen mentale is positioned between the roots of the first and second lower premolars. Similar results were published by Bokhari et al.[8] after analyzing of 900 panoramic radiographs in Saudi Arabia where 72% of the left mental foramen and 52% of the right mental foramen were positioned between the mandibular premolars. In a study performed with Chilean individuals, Fuentes et al.[9] found that foramen mentale is located on the longitudinal axis of the second premolar on the right side and between longitudinal axes of the first and second premolars on the left side, which shows similar results to our research. This positioning of foramen mentale has been confirmed and described in numerous textbooks and books in the field of anatomy and various dental disciplines.

Also, results from our research suggest that the most common position for foramen mentale is the third class (which means that foramen mentale is between the vertical axis of the second premolar and the line passing between the first and second premolars in the lower jaw). A similar common positioning of foramen mentale projected at the mesial half of the lower second premolar is presented in one research from 2016 published by [Thakare et al.](#)[10] In one series of 377 panoramic radiographs, analyzed by Chkoura and El Wady the most common position for the mental foramen was in line with the second premolar in 62.7%, followed by between the first and second premolars in 30%; thus these two positions accounted for 92.7% of the cases.[11]

This study does present some limitations, primarily because no patient information available to assess participant ethnicity and previous dental treatment. Also the sample size was small and magnification of the panoramic x-rays was not always used.

CONCLUSION

In conclusion, the present results showed variations in position of foramen mentale. So it must be noted that local differences in foramen mentale position may occur in a population. This variability should alert the oral surgeons while performing oral surgical and periodontal interventions. If the studies related to variations in the position of foramen mentale are carried out in larger numbers, this data will be reliable for dental medicine clinicians, and with this type of information the possibility of complications will be minimized.

REFERENCIES

- Phillips, J.L. & Weller, R.N. & Kulild, J.C. (1990). The mental foramen: 1. Size, orientation, and positional relationship to the mandibular second premolar. *J Endod.*;16(5), 221-223.
- Hasan, T. (2011). Characteristics of the Mental Foramen in Different Populations. *The Internet Journal of Biological Anthropology*,4(2), 1-6
- Jovevska, S. & Zisovska, E. & Nikolovska, L (2018). Anatomical variations of mental foramen in adult human mandibles. *Knowledge - International Journal, Scientific Papers*, 23.2 (2), 431-434
- Bello, S. A. & Adeoye, J. A. & Ighile, N., & Ikimi, N. U. (2018). Mental Foramen Size, Position and Symmetry in a Multi-Ethnic, Urban Black Population: Radiographic Evidence. *Journal of oral & maxillofacial research*, 9(4), e2. doi:10.5037/jomr.2018.9402
- Srinivas, N., Ramdurg, P., Puranik, S., Sali, K., & Ingaleshwar, P. (2017). The position of the mental foramen in the north and south Indian populations. *Acta Medica Academica*, 46(1), 44-49. doi:<http://dx.doi.org/10.5644/ama2006-124.185>
- Cartes, G. & Garay, I. & Deana, N. F. & Navarro, P., & Alves, N. (2018). Mandibular Canal Course and the Position of the Mental Foramen by Panoramic X-Ray in Chilean Individuals. *BioMed research international*, 2709401. doi:10.1155/2018/2709401
- Currie, C. C. & Meechan, J. G. & Whitworth, J. M. & Carr, A., & Corbett, I. P. (2015). Determination of the mental foramen position in dental radiographs in 18-30 year olds. *Dento maxillo facial radiology*, 45(1), 20150195.
- Bokhari, K. & Shahrani, A.A & Mustafa, A.B & Hdban ,Y. & Saleh, M. & Mofareh A. (2016). Position of Mental Foramen among Saudi Population: A Radiographic Study. *Int J Experiment Dent Sci* , 5(2), 109-112.
- Fuentes, R., & Cantin, M. & Navarro, P. & Borie, E. & Beltran, V. & Bucchi, C. (2014). Caracterización de Estructuras Anatómicas Mediante Radiografías Panorámicas: El Foramen Mental. *International Journal of Morphology*. 32(4), 1423–1429. doi: 10.4067/S0717-95022014000400047

Thakare, S. & Mhapuskar, A. & Hiremutt, D. & Giroh, V.R. & Kalyanpur, K. & Alpana, K.R. (2016) Evaluation of the Position of Mental Foramen for Clinical and Forensic Significance in terms of Gender in Dentate Subjects by Digital Panoramic Radiographs. *J Contemp Dent Pract* 1;17(9), 762-768.

Chkoura, A., & El Wady, W. (2013). Position of the mental foramen in a Moroccan population: A radiographic study. *Imaging science in dentistry*, 43(2), 71-5.