

Position of the Mental Foramen in Indian and Iranian Subjects: A Radiographic Study

U Bharathi¹, R M Prathibha Rani², Srisha Basappa³, Santosh Kanwar¹, Nishath Khanum¹

Contributors:

¹Post-graduate, Department of Oral Medicine & Radiology, Farooqia Dental College & Hospital, Mysore, Karnataka, India; ²Reader, Department of Oral Medicine & Radiology, Farooqia Dental College & Hospital, Mysore, Karnataka, India; ³Professor & Head, Department of Oral Medicine & Radiology, Farooqia Dental College & Hospital, Mysore, Karnataka, India.

Correspondence:

Dr. Bharathi U. #2617, Vontikoppal, Valmiki Road, Mysore - 570 002, Karnataka, India. Phone: +91-9035136510. Email: drbharatiu@gmail.com

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Abstract:

Background: Knowledge about the anatomical landmarks is essential for a clinician to provide the better treatment. By various studies, it is well-documented that position of mental foramen (MF) varies among different types of ethnic groups. This study was done to determine the position of the MF in relation to the apices of the teeth using panoramic radiographs in Indian and Iranian population. We also analyzed the symmetry of location of the MF within each individual.

Materials and Methods: A total of 40 panoramic radiographs (20 Indians and 20 Iranians) were analyzed with regard to the location and symmetry of the mental foramina in male and female subjects. Statistical analysis used: The results were analyzed using Chi-square test.

Results: The MF was situated below the apex of the second premolar in 52.5% of Indians, 47.5% of Iranians. 45% of it was between the first and second premolars among Indians and 47.5% of Iranians. It was symmetrically located in 70% of Indians and 60% of Iranians. There was no statistically significant difference was found between males and females in the position and symmetry of the MF.

Conclusions: The most common position of MF was below the second premolar and between the apices of the first and second premolar. MF is not always symmetrical in the same individual. From the study, we can suggest that the location of the MF is not a reliable landmark for distinguishing race but it is further necessary to do a study by considering larger sample size.

Key Words: Mental foramen, panoramic radiograph, premolar, symmetrical

Introduction

The mental nerve is one of the branches of the inferior alveolar nerve that exits through the mental foramen (MF). It provides sensory innervation to the lower lip and mucosa, buccal vestibule, and gingiva which is mesial to the first

mandibular molar. From various studies, it is clear that MF show variations in position among different ethnic groups. The mental nerve bundle can be injured while performing surgical procedures, like extraction of impacted teeth, periapical surgery, enucleation of cyst or tumor, and many more, resulting in paresthesia, or anesthesia in the area which is supplied by the mental nerve. Awareness about the site of the MF is helpful for accurate delivery of local anesthesia of branches of the inferior alveolar nerve. It also helpful in interpreting anatomical landmarks in forensics sciences.¹ According to human anatomy textbooks, the MF is located below the interval between the first and second premolar teeth, or below the apex of the second premolar, from which emerge the mental nerve and vessels, however, variations in the location of the foramen have been reported. It might be located between the apices of the lower premolars, below the apex of the second premolar and below the apex of the lower second premolar.² The purpose of the present study was to determine the position and symmetry of MF in a digital panoramic radiograph (orthopantomogram [OPG]) in Indian and Iranian population.

Materials and Methods

A prospective study conducted for the period of 10-month.

Inclusion criteria

- Patients with no history of extraction of the mandibular first and second premolars and first molar
- Patients in the age group of 20-40 years.

Exclusion criteria

- Patients with missing mandibular the first and second premolars and first molar
- Patients presenting with periapical pathology.

Subjects were selected by their ethnical/nationality background. The study comprised 40 patients in total divided into two groups of 20 each with equal gender distribution.

- Group I - Indians
- Group II - Iranians.

The assessment was made for the location of MF with its reference to the first and second premolars in a digital panoramic radiograph (OPG).

The OPG machine used in this study is "Sirona Orthophos XG" having specifications:

- 64 Kvp, 8 mA and 14 s.

The positions of MF:

- A. At the apex of the first premolar
- B. Between the apices of the first and second premolar
- C. Below the apex of the second premolar
- D. Between the apices of the second premolar and the first molar
- E. On the mesial half of the first molar.

Results

Results of the 40 panoramic radiographs were analyzed using Chi-square test, the most common position of MF was, below the apex of mandibular second premolar. The MF was situated below the apex of the second premolar in 52.5% of Indians, 47.5% of Iranians. It was between the apices of the first and second premolars in 45% Indians and 47.5% of Iranians. This is in accordance with previous studies.

MF symmetrically located in 70% of Indians and 60% of Iranians. P value was not significant (P > 0.05).

Discussion

In this study, determination of the position and symmetry of MF in different positions were observed. The MF was observed in position B and C in majority compared to the positions A, D, and E.

The next common position for the MF was position B - 40% on the right side, 50% on the left side of the Indians and it was 50% on the right side, 45% on the left side of the Iranians. In only 70% of Indians and 60% of Iranians, MFs were symmetrical (Table 1 and Figures 1). This shows that variability exists in MF position of the same subject (Figure 2). Radiography is the only non-invasive method available to plan treatments involving the mandible. Panoramic radiographs are commonly used to screen, diagnose, and select the best possible surgical approach. The location of the MF can change during jaw development. Therefore, the panoramic radiographs of adult patients who had completed their development were evaluated in this study. Patients missing teeth were excluded from the study, and the evaluation was made according to the premolars and molars that were present.

Mandibular nerve is the largest branch of trigeminal nerve (V3). The inferior alveolar nerve is one of the branches of mandibular nerve (Chummy, 2006; Bernard, 2001; Norton, 2007; Gosling et al., 1985). Inferior alveolar nerve enters the mandible through the mandibular foramen which is situated at the medial surface of the ramus (Ikeda et al., 1996; Wadu et al., 1997). The inferior alveolar nerve runs in the mandibular canal and is normally surrounded by cortical bone, it transverses the mandible from lingual to buccal side as it proceed anteriorly often by the first molar.

The inferior alveolar nerve then further divides into mental nerve and incisive nerve near the molar region (Wadu et al.,

Symmetry	Indians (%)	Iranians (%)
Symmetrical	14 (70)	12 (60)
Asymmetrical	6 (30)	8 (40)
Total	20	20

MF: Mental foramen

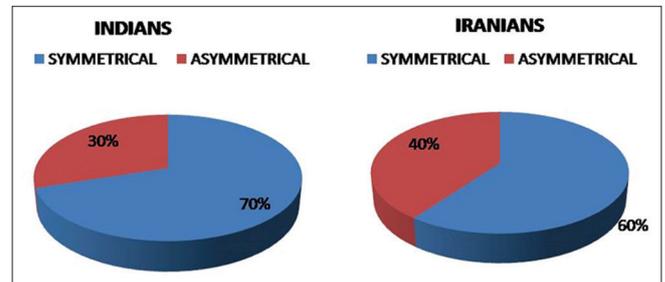


Figure 1: Percentage of symmetry in the position of mental foramen in Indians and Iranians.

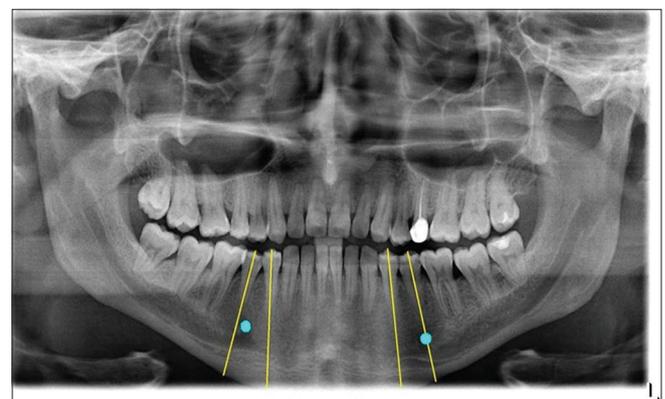


Figure 2: Variation in the position of mental foramen in the same subject.

1997). Mental nerve exits through the MF in conjunction with blood vessels.³

Studies done on North American white population by Moiseiwtsch and by Fishel et al. and on Northern Nigerian adults by Olasoji et al. showed that the most common position for the MF was between the first and second premolars. These findings are consistent with our results. However, studies carried out on other populations like Malays, Kenyan Africans, and Saudis, Asian Indians, and also the studies done by Phillips et al., have stated that the MF is most frequently situated below the second premolar tooth⁴ and also Accurate identification of the MF is essential for diagnosis of pathologies and mandatory for clinical procedures. Frequent failures are well-documented during mental nerve blocks shows that its variability of location. Radiological misinterpretation of MF as a radiolucent lesion in the apical region of the mandibular premolars can end up in iatrogenic injuries. Treatment strategies for dental implant patients it is must to know about the position as well as an anterior loop of MF as a critical surgical landmark and the important reference point during treatment planning. It is also well-documented by various studies, that iatrogenic trauma

caused to the mental nerve bundle because of improper prior assessment, would result in paresthesia from 8.5% to 24% for periods of up to 3-16 months post-surgically following implant surgeries.⁵ Amorim *et al.* conducted a study on edentulous mandibles and stated that position of the MF was altered in edentulous subjects when compared with dentate subjects.⁶ Panoramic radiography gives a two-dimensional image of three-dimensional structures that obscures the information about the mediolateral direction and overlap of structures in both the vertical and horizontal directions. Computed tomography provides better picture of the anatomical structures. But still, panoramic view radiographs are cost effective and easier for interpretation. Digital panoramic radiography provides better image quality. Especially, the visualization of the mental foramina can be further enhanced by evaluating digital panoramic radiographs with advanced software programs.

Panoramic imaging is the most common used investigation method to evaluate the jaws when planning implant surgeries and for other diagnostic purposes.⁷ Awareness about the site of the MF yields for proper delivery of local anesthesia for dental procedures and the avoidance of damage to the nerve in surgical procedures. It is also helpful in interpreting anatomical landmarks in oral pathology and forensics sciences as well.⁸

This study concludes that there is no statistically significant difference in the location of MF among Indians and Iranians. The most common position being below the apex of the second premolar (position C) and between the apices of first and second premolar (position B). MF is not always symmetrical in the same individual. From the study, we can suggest that the location of the mental foramen is not a reliable landmark for the distinguishing race but it is further necessary to do a study by considering a larger sample size.

Conclusion

The most common position of MF was below the second premolar and between the apices of the first and second

premolar. MF is not always symmetrical in the same individual. From the present study, we can suggest that the location of the MF is not a reliable landmark for distinguishing the race. However determining the position of the MF is essential, to prevent injury to the mental nerve bundle while performing surgical procedures, like extraction of impacted teeth, periapical surgery, enucleation of cyst or tumor, and many more, resulting in parasthesia, or anesthesia in the area which is supplied by the mental nerve. Panoramic radiographs can serve as a reliable tool to determine the position of the mental foramen.

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