

ORIGINAL RESEARCH

Radiographic localization of the mental foramen position in King Khalid University dental clinics patients in Abha – Saudi Arabia

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ABSTRACT

Background: Under local anesthesia when periapical and dental surgeries are performed or endodontic treatments are implemented in the mandible, it is essential to identify the mental foramen to prevent injuries. However, accurately identifying mental foramen is usually difficult. Its position is usually described below the second premolar but the individual variation is widespread. The aim of the study was to assess the mental foramen position and mandibular canal in Saudi population by using the panoramic radiography.

Methodology: Standard panoramic radiographs were performed. This cross-sectional study was conducted at KKU Dental Clinic. The patients' panoramic radiographs that were needed for different reasons were taken. The positions of 172 mental foramen were evaluated. The distances from the center of the mental foramen to the superior and inferior borders of the mandible and the apex of the second premolar were measured. The length of the mental foramen from the mandibular midline to the center of mental foramen was also measured.

Results: Among 172 patients, 62 patients (36%) were female (range: 18–43 years) and 110 patients (64%) were male (range: 19–55 years). 172 mental foramen positions were evaluated. Of the 62 female patients 48.4% (30) were positioned between the first and second premolars, 32.3% (20) patients were positioned under 2nd; and 110 male patients 54.5% (60) patients were positioned between the first and second premolars and 38.2% (42) patients were positioned under second premolar.

Conclusion: The mental foramen was near the second premolar and the inferior border of the mandible. This information may be used to perform safer mental nerve blocks in surgical interventions.

Keywords: Mandible, panoramic radiography, mandible radiography, anatomical landmarks, mandibular nerve.

Introduction

When administering the local anesthesia while performing periapical and dental surgeries or implementing endodontic treatments in the mandible, it is essential to identify the mental foramen to prevent injuries [1]. However, accurately identifying mental foramen is usually difficult. Its position is normally described as being below the second premolar, but the individual variation is widespread [2].

It is often possible to localize the mental foramen by radiographic or by palpation. It is essential to know about the normal range of possible locations [3,4]. The Panoramic radiography is usually used in dental clinics because it provides good teeth view of the anatomical structures, jaws and T.M.J (temporomandibular joints) [5–7]. When performing the local anesthesia (L.A) and surgical procedures in the oral and maxillofacial area, it is essential to consider the locations of the supraorbital,

infraorbital, and mental foramina neurovascular bundles. Understanding of all of this anatomy helps to prevent injuries to the neurovascular bundles and makes a big difference [3]. The panoramic X-ray is a two-dimensional (2D) image that lacks the buccolingual direction information and magnification in the horizontal and vertical directions. Computed tomography provides a

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Figure 1. Standard panoramic radiograph.

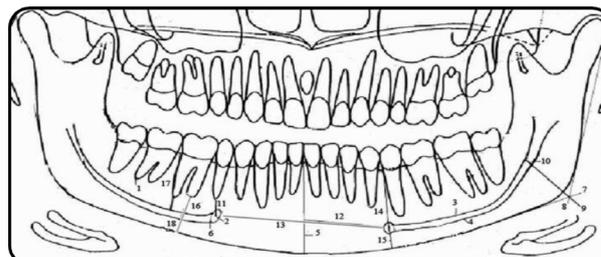


Figure 2. Anatomical landmarks.

Table 1. Mode distance from the center of the mental foramen to other landmarks in females.

Mental Foramen Measurements	Female (mm)
Mental foramen to the apex of second premolar.	5.9.
Mental foramen to the mandibular midline.	25.7–27.3.
Between two mental foramen.	49–53.5.
Mental foramen to the superior border of the mandible.	13–16.5 to 17–17.1.
Mental foramen to the inferior border of the mandible.	10–11.

Table 2. Mode distance from the center of the mental foramen to other landmarks in males.

Mental Foramen Measurements	Male (mm)
Mental foramen to the apex of the second premolar.	5.
Mental foramen to the mandibular midline.	24–26–27.
Between two mental foramen.	50.
Mental foramen to the superior border of the mandible.	14.
Mental foramen to the inferior border of the mandible.	12.

more precise visualization of the oral region anatomical structures [8]. However, panoramic radiographs are more economical and easy to handle to perform and interpret [9]. The panoramic radiographs quality can be increased by using digital panoramic radiography. In particular, visualization of the mental foramina can be enhanced by evaluating digital panoramic radiographs with software programs. Panoramic imaging is commonly used to assess the bone of the jaw when planning oral surgeries and for other purposes. Other studies have reported variations in the anatomical position of the mental foramen [10,11]. Additionally, the mental foramen position is varied in different ethnic groups [4] and genders [12].

Subjects and Methods

Standard panoramic radiographies were performed (Figure 1). This cross-sectional study was conducted at KKU Dental faculty. The patients' panoramic radiographs that were performed for different reasons were taken. Positions of 172 mental foramen were evaluated. The distances from the center of the mental foramen to the superior and inferior borders of the mandible and to the apex of the second premolar were measured. The length of the mental foramen from the mandibular midline to the center of mental foramen was also measured.

Standard panoramic radiographs of 18- to 55-year-old patients were reviewed thoroughly by the radiology department. The exclusion criteria were unclear anatomical landmarks, orthognathic surgery history or mandibular orthodontic treatments, history of mandibular fracture, dental disorders, and severely retarded mandible.

The anatomical landmarks included the mental foramen, radiographic apex of the second premolar, the superior–inferior borders of the mandible and the mandibular midline.

(11) The distance between the mental foramen and the apex of the second premolar. (12) The distance between the mental foramen and the mandibular midline. (13) The distance between two mental foramen. (14) The distance between the mental foramen and the superior border of the mandible (15). The distance between the mental foramen and the inferior border of the mandible (Figure 2). The data were analyzed by using SPSS software (version 11.2).

Results

Among the 172 patients, 62 patients 36% were female (range: 18–43 years). And 110 patients 64% were male (range: 19–55 years), the results obtained were shown in Tables 1 and 2.

172 mental foramen positions were evaluated. Of the 62 female patients, 48.4%(30) patients were positioned between the first and second premolars, 32.3%(20) patients were positioned under second premolar, 9.6%(6) patients were positioned under the first premolar, 6.5%(4) patients were positioned after the second premolar, and 3.2%(2) patients were positioned before the first premolar (Figure 3).

110 male patients 54.5% (60) patients were positioned between the first and second premolars, 38.2% (42) patients were positioned under second premolar, 5.5% (6) patients

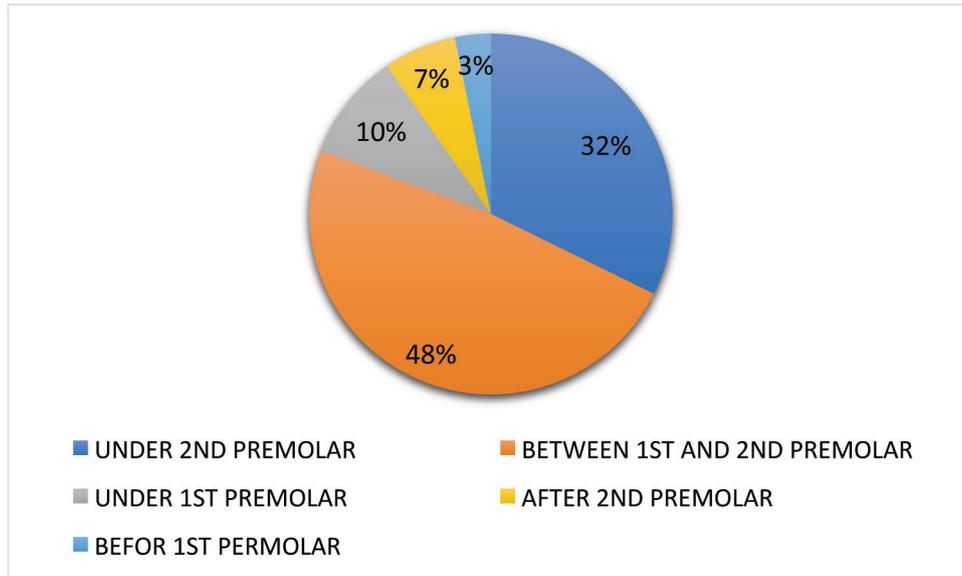


Figure 3. Percentage of mental foramen positions in female.

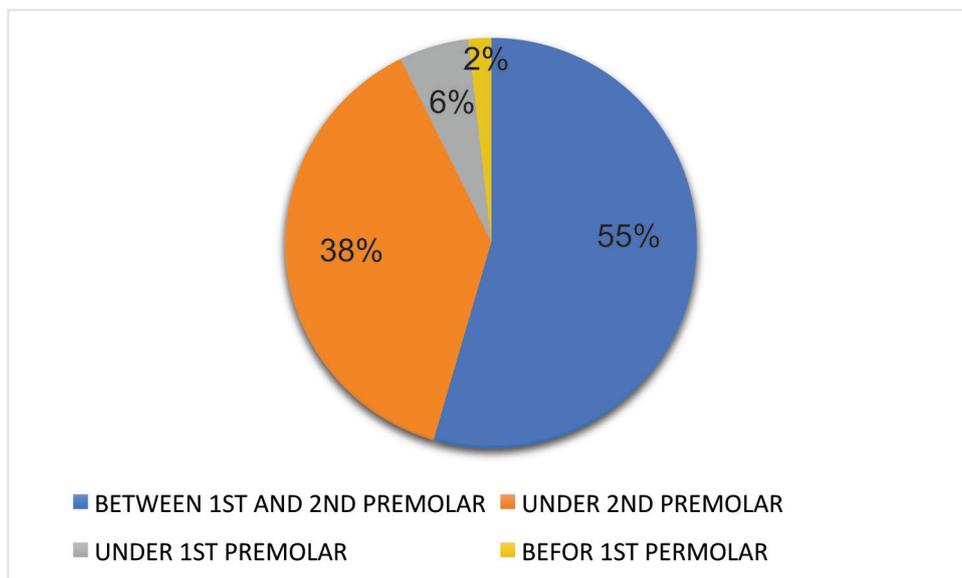


Figure 4. Percentage of mental foramen positions in males.

were positioned under first premolar, 1 and .8% (2) patients were positioned before first premolar (Figure 4).

Discussion

Radiography is the only noninvasive method available for treatment plans involving the mandible. The panoramic radiographs are used to screen and to diagnose and select the best options for surgical approach [13]. The mental foramen position can change during jaw growth [2]. The adult patients' panoramic radiographs, who had completed their development, were evaluated in this study. Patients who had missing tooth were excluded from this study and evaluation process was

made according to the premolars that were present. The mandibular canal is of particular importance to dentists and dental specialists, because it carries the dental division of the trigeminal nerve and the nerve that is supplying lower lip. For example, dentists must perform inferior alveolar nerve block injections to provide (L.A.) local anesthesia during a lot of dental procedures [14]. Panoramic radiography helps to locate mental foramen, through which the nerve supply to the lower lip passes and the mandibular canal during dental surgeries and dental implantations [14].

Failure to mental foramen protection may lead to permanent or temporary loss of lower lip sensation.

Panoramic radiographs were used because of certain advantages over intraoral radiography. They include a big area of hard and soft tissues and the visualized area in continuity that allows more horizontal and vertical dimensions, accurate for mental foramen. The panoramic view is practical in dental clinical studies because it provides a more precise image of the mental foramen in two dimensions (2D) [15,16].

On the other hand, periapical radiographs may not show the mental foramen position if it is under the film edge [2]. Younger patients were studied because in the mixed dentition, the mental foramen may be masked by the roots of permanent teeth [10]. The current study showed that the mental foramen is easily located in panoramic film, although the increased bone density can make the visualization more difficult and that makes it challenging [10].

Yosue and Brooks described these cases as an “unidentified type” of mental foramen [16], and these cases were excluded from the present study. These findings provide new data about the mental foramen anatomical characteristics in Saudi population.

In most cases, both mental foramen of the mandible had similar positions. The previous studies in other countries have reported different findings regarding the mental foramen position.

Olasoji et al. [17] reported that mental foramen was located between the first and second premolars in 34% of the cases and below the apex of the second molar in 24.5% of the cases. Ngeow and Yuzawati [10] reported that mental foramen was located under the second premolar in most cases and between the two premolars in 19.6% of the cases.

The differences in the bilateral mental foramen positions may occur if the mental foramen is funnel-shaped in the mandibular buccal cortex bone [15]. The mental canal passes from the posterior to the superior border of the mandible [14]. Position variation in the mental canal seems to be due to developmental disturbances of mandible during the fetal period. The mental foramen position may change due to dental loss and aging. Green also reported that the gender influences the position of the mental foramen [18]. Furthermore, genetics is an essential factor in the morphologic characteristics of dental structures [15].

Conclusion

The mental foramen location was found to be near the second premolar. This information can be used to perform safer mental nerve blocks during surgical interventions in periapical operations and to predict the probability of nerve damage in cases of overfills.

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Conflict of Interest

None

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Consent for publication

Not applicable

Ethical consideration

Not applicable

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