Identification of the Position of the Mental Foramen Based on Age in Patients at RSGM UMY Using Panoramic Radiography

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Abstract

The mental foramen is part of the mandible's anatomical structure, found on both sides of the mandible. Identification of the position of the mental foramen is clinically very important in dental practice, including in carrying out anesthesia, implant placement, endodontic treatment, and consideration of surgical procedures around the mental foramen to prevent damage to the nerve tissue and blood vessels that pass through the mental foramen. This study uses panoramic radiograph to determine the position of the mental foramen based on age in patients at Dental and Oral Hospital, UMY (RSGM UMY). This research is descriptive observational with a cross-sectional approach. A total of 132 mental foramen samples from RSGM UMY patients aged 12-35 years were grouped based on age of mandibular development. Data were divided into 6 groups based on the position of the mental foramen in relation to the lower jaw posterior teeth, then processed using a descriptive statistical method using Microsoft Excel. The results of this study showed that in the 12-16 year age group, the position of the mental foramen was most often found in position 3 with 21 (15.91%), while for those aged 17-25 years, it was 32 (24.24%) and for those aged 26-35 years old, 20 (15.15%) is most often found in position 4. Most mental foramen positions reviewed using panoramic radiograph at RSGM UMY were in position 4, parallel to the second premolar of the lower jaw.

Keywords: age; mental foramen; panoramic

INTRODUCTION

The mental foramen is part of the anatomical structure of the mandible found on both sides. Arteries and veins pass the mental foramen, and the mental nerve is a branch of the inferior alveolar nerve originating from the mandibular nerve.1 The mental foramen is an important factor in many surgical and clinical procedures in dental clinical practice. Accurate knowledge of the mental nerve and its position will help the clinician administer local anesthesia effectively. Implant placement and missing teeth are important from a prosthetic point of view. If the position of the mental foramen is ignored when carrying out invasive treatment in this area, it will cause neurosensory disorders.2

Knowledge of the regional anatomy of the mandible is very important to avoid injury to the nerve tissue and blood vessels that pass through the mental foramen. The failure rate for anesthesia in the mandible is higher than that for anesthesia in the maxilla. The highest percentage of failure occurs in mental nerve injuries after the inferior alveolar nerve.3 Failure to determine the location of the mental foramen can cause anesthesia to be less effective in the area to be operated or extracted. Apart from that, it can also cause damage to nerves or blood vessels when removing the roots of lower premolars and creating a buccal flap in the lower premolar region.4

The position of the mental foramen will change as the mandible grows and develops. The position of the mental foramen is found to vary with tooth eruption. In children, the mental foramen is usually found closer to the alveolar ridge, and when the tooth has begun to erupt, the mental foramen will descend to the middle
between the upper margin and the lower border. In adults who have had teeth for a long time, the mental foramen moves relatively close to the inferior border. In old age, due to tooth loss and resorption of the edentulous ridge, the position of the mental foramen relatively moves towards the alveolar ridge.\textsuperscript{2,5,6}

One way to determine the mental foramen's position is by using radiography. Radiography in dentistry has a very important role, especially in establishing a diagnosis and helping to plan treatment.\textsuperscript{7} Panoramic radiograph can help detect the position of the mental foramen as it can provide a comprehensive picture of the maxillofacial structure, including the upper jaw and lower jaw.\textsuperscript{8,9} This research aims to determine the mental foramen's position based on age in Dental and Oral Hospital UMY patients.

**MATERIAL AND METHODE**

This research is a descriptive observational study using a cross-sectional approach. The research was carried out at the Radiology Installation of the Dental and Oral Hospital of Universitas Muhammadiyah Yogyakarta utilizing all panoramic radiograph of patients from the Radiology Installation of the Dental and Oral Hospital UMY from July to September 2022 as the research population. The sample was selected using a probability sampling technique, namely simple random sampling. A total of 836 panoramic radiograph were collected as the research population, and 132 minimum samples obtained from calculations using the formula (Slovin, 1960), which met the inclusion and exclusion criteria in this study, were determined as research samples.

The panoramic radiograph were included as research samples if show a good picture of the mental foramen, has optimal density and contrast and minimal distortion. First premolar, second Premolar, and first molar have erupted completely.

Meanwhile, the panoramic radiographs were excluded from the study if the quality of the radiograph is poor that can not identify the mental foramen clearly.

Identification of the position of the mental foramen was carried out by observing the position of the mental foramen of the lower jaw posterior teeth, which were grouped into six positions, as follows:

1) Position 1: Located in the anterior of the lower premolar root 1.
2) Position 2: Located in line with the roots of the lower first premolars.
3) Position 3: Located between the roots of the lower jaw's first premolar and second premolar.
4) Position 4: Located in line with the root of the lower second premolar tooth.
5) Position 5: Located between the root of the second premolar and the mesiobuccal root of the lower first molar.
6) Position 6: Located in line with the mesiobuccal root of the first molar tooth.

Data was processed using descriptive statistical processing methods. This research has received approval from the Research Ethics Committee of the Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta, with the Ethical Clearance (EC) number 051/EC-EXEM-KEPK FKIK UMY/III/2023.

**RESULT**

A total of 132 panoramic radiography photos met this study's inclusion and exclusion criteria. The results of the observations revealed data in the following table.

**Table 1.** Distribution of the number of panoramic radiographs based on the age of the mandibular development process

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-16</td>
<td>44</td>
<td>33,33%</td>
</tr>
<tr>
<td>17-25</td>
<td>44</td>
<td>33,33%</td>
</tr>
<tr>
<td>26-35</td>
<td>44</td>
<td>33,33%</td>
</tr>
<tr>
<td>Total</td>
<td>132</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table 2. Distribution of mental foramen positions

<table>
<thead>
<tr>
<th>Position</th>
<th>12-16 years</th>
<th>17-25 years</th>
<th>26-35 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0,00%</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>0,76%</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>21</td>
<td>15,91%</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>19</td>
<td>14,39%</td>
<td>32</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>2,27%</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>0,00%</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>44</td>
<td>33,33%</td>
<td>44</td>
</tr>
</tbody>
</table>

Table 1 explains the grouping of samples based on the age of mandibular development, namely age 12–16 years (the age at which mandibular development increases), age 17–25 years (the age that shows relatively constant mandibular size), and age 26–35 years (the age that shows it has completion of the growth period). Table 2 shows the distribution of the position of the mental foramen in each age group. Based on table 2, it shows that in the 12–16 year age group, the percentage of mental foramen positions with the highest frequency is in position 3, where the mental foramen is located between the roots of the first premolar and second premolar of the lower jaw with a total of 21 (15.91%). In the 17 - 25 year age group, the percentage of the mental foramen position with the highest frequency is in position 4, where the mental foramen is located in line with the root of the lower second premolar tooth as much as 32 (24.24%). Meanwhile, in the 26 - 35 year age group, the percentage of the position of the mental foramen with the highest frequency is in position 4, where the mental foramen is located in line with the root of the mandibular second premolar, as much as 20 (15.15%).

**DISCUSSION**

The position of the mental foramen can vary between individuals. Ethnic differences can cause variations in the position of the mental foramen between one another. Apart from that, age can also cause variations in the position of the mental foramen in each individual. This variation can occur due to changes in the position of the mental foramen, along with the eruption of premolars and bone resorption. Therefore, the samples in this study were grouped based on age of mandibular development to make it easier for researchers to describe the position of the mental foramen based on age. A total of 132 samples were obtained, consisting of 44 samples aged 12 to 16 years, 44 samples aged 17 to 25 years, and 44 samples aged 26 to 35 years.

Results of panoramic radiographs with pathological conditions extending to the right and left regions of the mandible as well as all radiographic images that could not clearly show the mental foramen on both sides, were excluded as they could cause confusion in the study. Furthermore, radiographs from patients who lost teeth I1, I2, C, P1, P2, and M2 due to extraction or other reasons were excluded from the study to avoid the possibility of tooth migration as they would be used as a reference point in identifying the position of the mental foramen.

Based on the data in this study, the results obtained from the three age groups were seen using panoramic radiograph of patients at the Dental and Oral Hospital, UMY. Position 4, the most frequently found position, is the mental foramen's position below the lower jaw's second premolar. This result aligns with research from Ghandourah et al. (2023) regarding the analysis of the position of the mental foramen.
foramen. This study revealed that the position of the mental foramen was most commonly found in position 4, namely below the second premolar of the lower jaw. It is related to the growth of the mandible posteriorly or distally, which causes the position of the mental foramen to move in a horizontal plane posteriorly.

The position of the mental foramen changes posteriorly as the mandible grows. These changes are caused by the lengthening of the mandibular corpus followed by the mandibular foramen and the blood vessels within it. The position of the mental foramen will change as the mandibular ramus grows posterior to the mandibular body. It causes lengthening of the mandibular corpus, which will later be used as a place for the eruption of permanent molars. Changes in the position of the mental foramen also occur with changes in the alveolar process, mandibular condyle and mesial movement of the teeth. Growth and development of the mandible occurs in late adolescence and tends to be constant at the age of 17 to 25 years and in adulthood, namely age 26 to 35, showing that the mandibular growth period has been completed. It aligns with research on the results of panoramic radiography photos of patients at the Dental and Oral Hospital, UMY, which found no changes in position in the late teenage and adult age categories.

CONCLUSION
The position of the mental foramen based on age in the population at the Dental and Oral Hospital UMY was found to be in position 4, namely below the second premolar of the lower jaw.

ACKNOWLEDGMENT
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REFERENCES


