Estimation of the position of mental foramen and its relation to lower premolars and base border of the mandible during aging

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ABSTRACT

Background: The mental foramen is located in the apical region of the mandibular premolars but it have some variations regarding its distance to both lower premolars and the base border of the mandible that may make a problem especially for the oral surgeon in his work during operations like implantation, so, our study was done to estimate the position of the mental foramen and its relation to the lower premolars and the base border of the mandible by the aid of digital panoramic radiographs.

Material and method: The sample of this study was collected from patients who attended AL-Karama specialized center for dentistry. Forty five patients were selected in this study with the age range between 21-50 years that divided into three groups according to special criteria. Forty five digital views (OPG) were taken for Iraqi patients, using computerized digital panoramic x-ray machine. All radiographs were examined and then the position of the mental foramen for each patient was estimated.

Results & conclusion: The results revealed that the mental foramen is most commonly located below the apex of the 2nd premolar in all age groups used in this study, and the distance between the mental foramen and the base border of the mandible is indirectly proportional with age.

Key words: Mental foramen, base border of mandible, digital radiograph, OPG.

INTRODUCTION

The mental foramen is an opening or hole in bone located on the external surface of the mandible in the region of the mandibular premolars. On a mandibular periapical radiograph the mental foramen appears as a small ovoid or round radiolucent area located in the apical region of the mandibular premolars. The mental foramen is frequently misdiagnosed as a periapical lesion because of its apical location (1).

Knowledge of the position of the mental foramen is very important both when administering regional anesthesia and performing periapical surgery in the mandible (2).

Although it is often possible to identify the mental foramen by pulparation and radiographically, knowing the normal range of possible location is essential (3).

The image of mental foramen is quite variable, and it may be identified only about half the time because the opening of the mental canal is directed superiorly and posteriorly.

As a result, the usual view of the premolars is not projected through the long axis of the canal opening. This condition is responsible for the variable appearance of the mental foramen. The foramen is seen about halfway between the lower border of the mandible and the crest of the alveolar process, usually in the region of the apex of the second premolar. Also, because it lies on the surface of the mandible, the position of its image in relation to the tooth roots is influenced by projection angulation. It may be projected anywhere from just mesial of the permanent first molar roots to as far anterior as mesial of the first premolar root (4). The mental foramen (MF) is located below the interval between the premolar teeth, or below the second premolar, from which emerge the mental nerve and vessels (5). However, variations in the location of the foramen have been reported. It may occur between the apices of the lower premolars, below the apex of the first premolar and below the apex of the lower second premolar (6-10).

In a recent report, reviewed the status of research on the location of the mental foramen, and concluded that the typical location is just below the apex of the lower second premolar (11).

The aims of the study are:

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(3) Assistant Lecturer in the department of oral radiology in the college of dentistry – Al- Mustansiria university.
1-To estimate the position of mental foramen, its relation to the apices of the lower first and second premolars.
2- To estimate the position of mental foramen, its relation to the inner border of the base of mandible.

MATERIALS AND METHODS

Forty five patients with the age ranged 21-50 were selected from patients, attending AL-Karama specialized center for dentistry, according to a special criteria:
1-Presences of both lower premolars on each side and are sound.
2-Patients not complain from any disease that cause bone resorption like diabetes mellitus, periodontitis…..etc.

The samples were divided into 3 equal groups regarding age as the following:
-First group: 21-30 years (15 patients).
-Second group: 31-40 years (15 patients)
-Third group: 41-50 years (15 patients).

Forty five digital views (OPG) were taken for the patients, using computerized digital panoramic x-ray machine, which are examined for estimation the position of the mental foramen for each patient.

The distance between mental foramen and the followings were measured (Figure 1):
1-The inner border of the base of the mandible.
2-The apex of the lower first premolar.
3-The apex of the lower second premolar.

These measurements were done by using ruler on the computer monitor. Readings were obtained from both left and right sides of the mandible.

![Figure 1: Measurement of the distance between mental foramen and the apices of both lower premolars and the inner border of the mandible.](image)

**Table 1:** Comparison between Age groups for the position of mental foramen in relation to the inner border of the base of the mandible.

<table>
<thead>
<tr>
<th>Age group</th>
<th>Mean</th>
<th>NO.</th>
<th>p-value</th>
<th>Df</th>
<th>NO.</th>
<th>Mean</th>
<th>Age group</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-30</td>
<td>15.7</td>
<td>30</td>
<td>.000</td>
<td>29</td>
<td>30</td>
<td>15.7</td>
<td>21-30</td>
</tr>
<tr>
<td>31-40</td>
<td>13</td>
<td>30</td>
<td>.000</td>
<td>29</td>
<td>30</td>
<td>13</td>
<td>31-40</td>
</tr>
<tr>
<td>41-50</td>
<td>10.6</td>
<td>29</td>
<td>.000</td>
<td>29</td>
<td>30</td>
<td>10.6</td>
<td>41-50</td>
</tr>
</tbody>
</table>

**Table 2:** Comparison between age groups for the position of mental foramen regarding lower premolars.

<table>
<thead>
<tr>
<th>Maximum</th>
<th>Minimum</th>
<th>Std. Error</th>
<th>Std. Deviation</th>
<th>Mean</th>
<th>N</th>
<th>Age group</th>
<th>Mental foramen</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.85</td>
<td>2.70</td>
<td>.44447</td>
<td>2.43448</td>
<td>6.173</td>
<td>30</td>
<td>21-30</td>
<td>Close to the second premolar</td>
</tr>
<tr>
<td>9.83</td>
<td>2.35</td>
<td>.62436</td>
<td>2.41815</td>
<td>6.156</td>
<td>15</td>
<td>31-40</td>
<td></td>
</tr>
<tr>
<td>12.71</td>
<td>2.01</td>
<td>.46929</td>
<td>2.43850</td>
<td>5.880</td>
<td>27</td>
<td>41-50</td>
<td></td>
</tr>
<tr>
<td>12.71</td>
<td>2.01</td>
<td>.28312</td>
<td>2.40239</td>
<td>6.061</td>
<td>72</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>11.80</td>
<td>3.32</td>
<td>1.05562</td>
<td>2.98574</td>
<td>7.653</td>
<td>18</td>
<td>21-30</td>
<td>Close to the first premolar</td>
</tr>
<tr>
<td>11.32</td>
<td>5.61</td>
<td>1.00250</td>
<td>2.24167</td>
<td>7.588</td>
<td>5</td>
<td>31-40</td>
<td></td>
</tr>
<tr>
<td>6.70</td>
<td>4.42</td>
<td>.41137</td>
<td>.91985</td>
<td>5.660</td>
<td>5</td>
<td>41-50</td>
<td></td>
</tr>
<tr>
<td>11.80</td>
<td>3.32</td>
<td>.57128</td>
<td>2.42372</td>
<td>7.082</td>
<td>18</td>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>
RESULTS

Mental foramen position in relation to the inner border of the base of the mandible:
The results show that the distance between the mental foramen and the base border of the mandible, for (first age group) ranged between 12.21mm to 27.50mm with the mean value 15.7, for the (second age group) ranged between 11.75mm to 16.12mm with the mean value 13, and for (third age group) ranged between 9.25mm to 12.56 mm with the mean value 10.6 and there is high significant differences between age groups as shown in table 1 and figure 2.

Table 3: Statistical analysis between groups regarding both lower premolars

<table>
<thead>
<tr>
<th></th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean of square</th>
<th>F</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close to 1st premolar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between groups</td>
<td>13,977</td>
<td>2</td>
<td>6,989</td>
<td>1.221</td>
<td>.323</td>
</tr>
<tr>
<td>Within groups</td>
<td>85,887</td>
<td>15</td>
<td>5,726</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>99,865</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Close to 2nd premolar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between groups</td>
<td>1,433</td>
<td>2</td>
<td>.716</td>
<td>.121</td>
<td>.886</td>
</tr>
<tr>
<td>Within groups</td>
<td>408,341</td>
<td>69</td>
<td>5,918</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>409,774</td>
<td>71</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 2: Comparison between age groups for the position of the mental foramen in relation to the inner border of the base of the mandible.

Mental foramen position in relation to the lower premolars:
Table 2 demonstrates the mental foramen to be most commonly located below the apex of second premolar for right and left sides (closed to the second premolar) in all age groups.
The total number of mental foramen that closed to the second premolar was 72 in all age groups and the mean distance was 6.06 while the total no. of mental foramen that closed to the first premolar was 18 in all age groups and the mean distance was 7.08, and there are no significant differences between groups table 3.

DISCUSSION

Knowing the site of the mental foramen allows for accurate delivery of local anesthesia for dental procedures and the avoidance of damage to the nerve in surgical procedures. It also aids in interpreting anatomical landmarks in oral pathology and forensics.

This work was built on and extends the work of Green, in which he re-analyzed and critically evaluated data from 45 studies of the location of the mental foramen in skulls or on radiographs.

The affect of aging on the mental foramen position in relation to the base border of the mandible:
The results show that the distance between the mental foramen and the base border of the mandible proportionate indirectly with age of the patient and the distance is decreasing with ageing and this may be due to bone resorption that cause thinning of the base border of the mandible. This result agreed with Wang et.al and Aktekin et.al.

The position of the mental foramen regarding lower premolars:
The results show that the mental foramen is most commonly located below the apex of second premolar for right and left sides in all age groups. This results were in agreement with various investigation that reported the position as most commonly below the second premolar.

Our results disagree with some published reports that reported the position of the mental foramen between the first and second premolar teeth, and this may be due to the
differences of the type of the sample and ethnicity.

The foraminal position apparently moved distally with age and this was likely to be associated with mesial tooth drift and age-related attrition (10), and this was in agreement with our study.

REFERENCES