ORIGINAL ARTICLE

Radiographic study of mental foramen type and position in Bangalore population

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Abstract

Background: The mental foramen is defined as the entire funnel-like opening in the lateral surface of the mandible at the terminus of the mental canal. The mental foramen marks the termination of mandibular canal in the mandible, through which the inferior alveolar nerve and vessels pass. Position of the mental foramen is important when administering regional anesthesia. The aim of this study was to determine the most common type and position of mental foramen in Bangalore population using digital panoramic radiographs.

Materials and Methods: A total of 100 (50 M and 50 F) digital panoramic radiographs were collected from Department of Oral Medicine and Radiology within age of 15-50 years, type and position of mental foramen was analyzed.

Results: The most common occurrence is Type I and position 4 (symmetrical) of mental foramen. Comparison of type in males and females appears significant. Comparison of the position in males and females appears not significant.

Conclusion: The following study suggests that clinicians should carefully identify mental foramen thus minimizing complications during implant, orthognathic surgery and treatment of maxillofacial injuries.

Introduction

Knowing the location of the mental foramen is very important when considering placing implants or any other surgical procedure in the foraminal region. Mental foramen is a small foramen situated in the anterolateral aspect of the body of the mandible.

The mental foramen is defined as the entire funnel-like opening in the lateral surface of the mandible at the terminus of the mental canal. This foramen is contained entirely within the buccal cortical plate of bone. The average size of the foramen is 4.6 mm horizontally and 3.4 mm vertically on the lateral surface of the mandible. The foramen is usually larger on the left side of the mandible. Schaeffer stated that mental foramen was located between the spaces of mandibular premolars.

Mental foramen’s anatomical position is of significant importance in giving local anesthesia, treatments of fractures related to parasympysis area, osteotomies required for orthognathic and implant placement, giving complete denture in mandible etc. Inferior alveolar nerve gives mental and incisive branch inside the canal. Mental nerve emerges from mental foramen and supply sensory innervations to the soft tissues of the chin, lower lip and gingival on the ipsilateral side of the mandible.

Yosue and Brooks classified into four types (Type I: Mental canal is continuous with the mandibular canal. Type II: The foramen is distinctly separated from the mandibular canal.

Figure 1: Orthopantomogram showing type and position of mental foramen

Keywords
Mandibular canal, mental foramen, panoramic radiograph

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Type III: Diffuse with a distinct border of the foramen.
Type IV: “Unidentified group.”

**The position of the image of the mental foramen was recorded as follows**

Position 1: Situated anterior to the first premolar.
Position 2: In line with the first premolar.
Position 3: Between the first and second premolar.
Position 4: In line with the second premolar.
Position 5: Between the second premolar and first molar.
Position 6: In line with the first molar.

The accurate identification of the mental foramen is important for both diagnostic and clinical procedures. The radiographic appearance of the mental foramen may result in a misdiagnosis of a radiolucent lesion in the apical area of mandibular premolar teeth. Hence, the aim of this study was to determine the most common type and position of mental foramen in Bangalore population using digital panoramic radiographs.

**Materials and Methods**

Total of 100 (50 M and 50 F) digital panoramic radiographs were collected from Department of Oral Medicine and Radiology within age of 15-50 years who were advised for radiographs for various purposes, ethical clearance was obtained. Type and position of mental foramen was analyzed. All panoramic radiographs were taken by Sirona panoramic machine. The magnification factors reported by the manufacturers were 1.2 and 1.25, respectively.

**The radiographs were chosen according to the following criteria**

**Inclusion criteria**
- All mandibular teeth from the right first molar to the left first molar were present
- Erupted teeth
- The films must be free from any radiolucent or radiopaque lesion in the lower arch and showed no radiographic exposure or processing artifacts.

**Exclusion criteria**
- Radiographs in which the lower teeth (between 36 and 46) were missing, had deep caries, root canal treatment or various restorations were eliminated because of a possible associated periapical radiolucency
- Radiographs that showed the lower canine was missing were excluded because of the possibility of mesial premolar drift
- Panoramic radiographs in which the mental foramen could not be identified were excluded.

**Results**

In 100 panoramic radiographs of mental foramen, most common type and position was studied and recorded by performing Chi-square test. The most common Type I is mental canal is continuous with the mandibular canal of mental foramen (53.5%), followed by Type III diffuse with a distinct border of the foramen (31.5%), Type II the foramen is distinctly separated from the mandibular canal (14.0%) Type IV unidentified group (1%) [Table 1].

The most frequent position 4 is in line with second premolar of mental foramen (63.5%). The second common position was position 3 between first and second premolar (23.0%) followed by position 5 between the second premolar and first molar (9.0%), position 2, in line with the first premolar (3.5%), position 1 situated anterior to the first premolar, position 6 in line with the first molar (0%) [Table 2].

Comparison of type in males and females appears significant. Comparison of the position in males and females appears not significant. Sex analysis showed a higher female percentage of 60% in Type I [Graph 1]. Sex analysis showed a higher female percentage of 84% in position 4 [Graph 2].

**Discussion**

Mental foramen is a key factor in many of the surgical as well as clinical procedures in routine clinical practice. The mental foramen represents the termination of the mental canal. The mental nerve passes through the mental foramen, supplying sensory innervation to the lower lip, buccal vestibule, and gingiva mesial to the first mandibular molar. The mental foramen has been reported to vary in position in different ethnic groups.

Knowing the site of the mental foramen allows for accurate delivery of local anesthesia of terminal incisive branches of the inferior alveolar nerve. The mental bundle can be traumatized during surgical procedures, such as periapical

**Table 1: Distribution of type in males and females**

<table>
<thead>
<tr>
<th>Type</th>
<th>Male n (%)</th>
<th>Female n (%)</th>
<th>Total n (%)</th>
<th>χ²</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>46 (46.0)</td>
<td>61 (61.0)</td>
<td>107 (53.5)</td>
<td>9.976</td>
<td>0.019**</td>
</tr>
<tr>
<td>2</td>
<td>13 (13.0)</td>
<td>15 (15.0)</td>
<td>28 (14.0)</td>
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</tr>
<tr>
<td>3</td>
<td>41 (41.0)</td>
<td>22 (22.0)</td>
<td>63 (31.5)</td>
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</tr>
<tr>
<td>4</td>
<td>0 (0.0)</td>
<td>2 (2.0)</td>
<td>2 (1.0)</td>
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<tr>
<td>Total</td>
<td>100 (100.0)</td>
<td>100 (100.0)</td>
<td>200 (100.0)</td>
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</table>

**Table 2: Distribution of position in males and females**

<table>
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<th>Total n (%)</th>
<th>χ²</th>
<th>P value</th>
</tr>
</thead>
<tbody>
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<td>Female</td>
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<td></td>
</tr>
<tr>
<td>2 (2.0)</td>
<td>0 (0.0)</td>
<td>2 (1.0)</td>
<td>4.296</td>
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<tr>
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<td>7 (3.5)</td>
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<tr>
<td>22 (22.0)</td>
<td>24 (24.0)</td>
<td>46 (23.0)</td>
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<tr>
<td>63 (63.0)</td>
<td>64 (64.0)</td>
<td>127 (63.5)</td>
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<tr>
<td>11 (11.0)</td>
<td>7 (7)</td>
<td>18 (9)</td>
<td></td>
</tr>
<tr>
<td>100 (100)</td>
<td>100 (100)</td>
<td>200 (100)</td>
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</tbody>
</table>

**Table 3: Comparison of type and position**

<table>
<thead>
<tr>
<th>Type</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>46</td>
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<td>107</td>
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<td>3</td>
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<td>4</td>
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<td>2</td>
<td>2</td>
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<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>200</td>
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This position is consistent with findings of Yosue and Brooks\(^4\) in relation to types of mental foramen and in relation to position Agarwal and Gupta,\(^{21}\) Prabodha and Nanayakkara\(^{22}\) Neo\(^{23}\) and Gupta and Soni.\(^{24}\) The same position was observed in Tanzanian adult black male,\(^{24}\) Malay population\(^9\) Brazilian,\(^{21}\) Sankar \textit{et al.},\(^{26}\) Malawian mandible,\(^{27}\) Uko\textit{ha}\(^{28}\) in south eastern Nigerian Singh \textit{et al.}\(^{29}\) and Kanta \textit{et al.}. Jasser and Nwoku observed most common position as in line with the longitudinal axis of second premolar closely followed by location between first and second premolar in radiographic study of Saudi Arabians.\(^{30}\)

Panoramic radiographs were used in this study because the mental foramen was seen more consistently on the wide field of view in panoramic radiographs of the mandible than on periapical radiographs. A weakness of our study is the use of panoramic radiographs for localization of the mental foramen instead of the use of an anatomic study on skulls. panoramic radiographs showed a greater displacement of the foramen compared with anatomical measurements; however, the difference in the horizontal position found by the two methods was not statistically significant. Further anatomical studies using skulls should be conducted in a Bangalore population. The limitations of this study are small sample size. A larger sample size would also enable a more detailed assessment of the position and type of mental foramen.

**Conclusion**

The present study reveals valuable insights on the information concerning the type and position of mental foramen in Bangalore population. The following study suggests that clinicians should carefully identify mental foramen thus minimizing complications during implant, orthognathic surgery and treatment of maxillofacial injuries. Hence, our study may provide the necessary data of mental foramen among population and may be useful for the surgeons, anesthetists, neurosurgeons and dentists to carry out procedures without complications.

**Clinical significance**

Position of the mental foramen is important when administering regional anesthesia. Mental foramen identification and preservation of mental nerve during:

- Periapical surgery
- Implant surgery
- Maxillofacial trauma
- Orthognathic procedures.

**References**


