CBCT Analysis of Anterior Maxillary Anatomy Shows Age- and Gender-related Variance in Morphology

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Introduction

- Immediate implant placement in the anterior maxilla can be as successful as early implant placement or delayed implant placement with alveolar ridge preservation
- Perforation of nasal fossa or nasopalatine canal (NPC) is not uncommon when placing immediate implants in sites of maxillary central incisors (fig. 1) (fig. 2)
- Practitioners may not be as aware of these structures when compared with awareness of the maxillary sinus in posterior sites
- Perforation of the nasal fossa can cause similar sinus issues, or even lead to spontaneous nasal expulsion
- Encasement of the NPC may be a clinical possibility

Methods

- Patients were included with a CBCT scan of bothatraumatically retained maxillary central incisors (#8, #9)
- Patients were excluded in cases of missing central incisors, abnormal pathology, or traumatic history in the incisal area
- 5 measurements were taken relative to each incisor for all patients (fig. 3) (fig. 4)
  - Parameter 1: Distance from incisal root apex to floor of nasal fossa
  - Parameter 2: Distance from incisor to NPC at crestal level (buccal cortical plate)
  - Parameter 3: Distance from incisor to NPC at mid-root level
  - Parameter 4: Distance from incisor to NPC at apical level (incisal root apex)
  - Parameter 5: Lateral width of NPC at mid-root level
- Data was further separated by gender, age group, and incisal position (#8, #9)
- Genders (only male and female reported) were compared using unpaired t tests
- Age groups were compared using single-factor ANOVA

Results

- 140 patients were analyzed from ECU School of Dental Medicine database (table 1)
  - Means and standard deviations represent pooled data between both maxillary incisors

Table 1. Means and standard deviations of each measurement, sorted by group.

<table>
<thead>
<tr>
<th></th>
<th>Number of cases</th>
<th>Distance to nasal fossa</th>
<th>Inter-NPC distance (mid-root)</th>
<th>Inter-NPC distance (mid-root)</th>
<th>Lateral NPC width (mid-root)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>140</td>
<td>7.2±1.8 ±7.6</td>
<td>1.97±1.2 ±7.5</td>
<td>4.27±1.2 ±7.5</td>
<td>4.45±0.9 ±7.9</td>
</tr>
<tr>
<td>Male</td>
<td>55</td>
<td>7.2±1.8 ±7.6</td>
<td>1.9±1.2 ±7.5</td>
<td>4.3±1.2 ±7.5</td>
<td>4.5±0.9 ±7.9</td>
</tr>
<tr>
<td>Female</td>
<td>85</td>
<td>7.2±1.8 ±7.6</td>
<td>1.97±1.2 ±7.5</td>
<td>4.27±1.2 ±7.5</td>
<td>4.45±0.9 ±7.9</td>
</tr>
<tr>
<td>Age 8-39</td>
<td>20</td>
<td>6.4±1.8 ±7.8</td>
<td>1.7±1.2 ±7.5</td>
<td>4.1±1.2 ±7.5</td>
<td>4.3±0.9 ±7.9</td>
</tr>
<tr>
<td>Age 40-49</td>
<td>12</td>
<td>5.4±1.8 ±7.8</td>
<td>1.7±1.2 ±7.5</td>
<td>4.1±1.2 ±7.5</td>
<td>4.3±0.9 ±7.9</td>
</tr>
<tr>
<td>Age 50-59</td>
<td>36</td>
<td>6.9±1.2 ±7.6</td>
<td>1.7±1.2 ±7.5</td>
<td>4.2±1.2 ±7.5</td>
<td>4.2±0.9 ±7.9</td>
</tr>
<tr>
<td>Age 60-69</td>
<td>45</td>
<td>7.4±1.2 ±7.8</td>
<td>1.8±1.2 ±7.7</td>
<td>4.5±1.2 ±7.9</td>
<td>4.5±0.9 ±7.9</td>
</tr>
<tr>
<td>Age 70+</td>
<td>27</td>
<td>8.4±1.3 ±7.3</td>
<td>1.8±1.2 ±7.4</td>
<td>2.0±1.2 ±8.1</td>
<td>4.3±0.9 ±8.1</td>
</tr>
</tbody>
</table>

All measurements in mm.

- Patients were filtered out using normal distribution (fig. 5a) (fig. 6a)
- Distance from root apex to floor of nasal fossa tends to increase with increased age (table 1)
- However, variance also increases in older age groups for parameter 1
- 4mm of distance from apical tip of implant to the floor of the nasal fossa is indicated for immediate implant placement (fig. 5a) (fig. 6a)
- 2mm of distance from implant edge to NPC is indicated for immediate implant placement (fig. 5b-d) (table 2)

Discussion

- Immediate implants are generally preferred in the anterior maxilla
- Distribution of distances from incisal root apex to the floor of the nasal fossa indicates adequate immediate implant stabilization in most patients (fig. 5a) (table 2)
- Distributions of distances from incisal edge to NPC indicate large percentage of patients have less than clinically indicated space at the crestal and mid-root levels (fig. 5b-c)
- Further research needed to determine causes of age-related difference in distance to the nasal fossa, impact of tooth angulation and overjet on distances to NPC

Conclusion

Thank you to the ECU School of Dental Medicine, as well as Brody School of Medicine for this opportunity. I was welcomed warmly by all on campus, most notably by my supervisors, who have taught me invaluable lessons during this experience.

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