Bone quantity in patients with agenesis of the lower second premolar evaluated in CT scans

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Background

In Europe agenesis of a permanent tooth has a prevalence of 2.6 - 11.3%. The lower second premolar and the upper lateral incisor are most often affected except for wisdom teeth (Larmour 2005). Among others implant placement is a frequent treatment option to replace the missing tooth. Yet, as the alveolar bone is a tooth depending structure, tooth agenesis might be accompanied by a reduced amount of bone. Ostler & Kokich (1994) presented approximately 25% alveolar ridge width loss within 3 years after lower second premolar extraction measured on casts, which are representing the soft and hard tissue. Yet, tooth agenesis might cause a reduced amount of alveolar bone already with the primary tooth still in situ.

Aim

The primary aim was to assess radiographically mandibular bone quantity and dimension in patients with agenesis of the lower second premolar but the primary tooth still in situ and compare to a matched control group with regularly erupted lower second premolars. Second, the mandibular bone quantity and dimension in the area of the neighbouring teeth were assessed. Third, the region of the second premolar was evaluated as implant site for standard implant placement.

Materials and Methods

Altogether, 100 mandibular CT scans were included; 50 patients with agenesis of a second premolar but the primary tooth in situ and the first premolar and molar regularly erupted (test group) and 50 patients matched according to age, sex, and tooth’s quadrant and regularly erupted first and second premolars and first molars (control group). The dental reconstructions slices in the centre of the first and second premolar and the first molar were assessed on the following parameters: width (measured each millimetre starting from the buccal alveolar crest), height, and area of the mandibular bone. The region of the second premolar was evaluated as possible implant site (Figure 1).

Results

Mean width and area of the mandibular bone of the test group were significantly reduced in the region of the first and second premolar compared to the control group. No differences were noticed for the region of the first molar and for height measurements (Table 1). The mean width in the upper third of the mandibular bone (11 to 10 mm) was not reduced in all three regions. Yet, the mean width of the middle (11 to 20 mm) and of the lower third (>20 mm) was significantly reduced in the test group in the region of the first and second premolar, but not of the first molar (Table 1, Figure 2 and 3). In the test group in 42 out of 50 cases (84%) the placement of an implant would have been possible compared to 100% in the control group.

Table 1. Comparison of the assessed parameters between agenesis and control group in all 3 assessed regions (Independent t-test with controlling the false discovery rate by applying the Benjamini-Hochberg method).

<table>
<thead>
<tr>
<th>region</th>
<th>group</th>
<th>1a premolar</th>
<th>1b premolar</th>
<th>1a molar</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>control</td>
<td>8.9 ± 1.31</td>
<td>8.7 ± 1.29</td>
<td>9.1 ± 1.48</td>
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<tr>
<td>S.D.</td>
<td>control</td>
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<td>0.31</td>
<td>0.35</td>
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<td>control</td>
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</tr>
</tbody>
</table>

Significant values (p<0.05) are presented in bold. S.D. standard deviation.

Conclusions and Clinical implications

In patients with agenesis of the lower second premolar, but the primary tooth still in situ, mandibular bone quantity is reduced in the region of the agenesis and at the mesial adjacent tooth. However, bone width is reduced only in an area below the first 10 mm, which is not impairing the placement of a standard implant in a high percentage of the cases. In order to test whether the primary tooth is able to preserve the bone quantity in the upper third of the mandibular bone, these data will be compared in an on-going study to agenesis patients with the primary tooth already missing.

References