Prospective Clinical Assessment of Pulp Sensitivity After Chin Bone Harvesting

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The use of autogenous bone grafts for restructuring atrophied alveolar crests before rehabilitation with dental implant placement has become a gold standard treatment. Several studies have shown that the mandibular symphysis is a suitable donor area for such graft material offering easy access and a good quantity bone tissue of a suitable quality.1–4 The literature also reports that the ectomesenchymal and membranous origin of bone tissue removed from this region ensures early vascularization and the maintenance of its volume and viability during the period of incorporation, all of which makes its use highly reliable with very successful results.5–8

Currently, the use of this particular donor area is indicated in cases of alveolar reconstruction involving extensions of up to 4 teeth or sites involving 1 tooth or 2 teeth, which require gains in alveolar height and/or thickness. The literature also reports its use in the correction of alveolar-palatine clefts where special care is recommended to avoid any damage to permanent tooth buds.5,6,9

Proposal: Evaluate pulp vitality of mandibular teeth after chin bone harvesting.

Materials and Methods: Thirty patients underwent chin bone harvesting and accompanied for 12 months, being submitted to testing for pulp vitality with Endo Ice refrigerant spray to produce a local temperature of −50°C. The statistical analysis was executed with McNemar test with P value < 0.05.

Results: Results show that canine teeth are most susceptible to alterations; 68.82% (181) of the teeth tested showed no loss of pulp sensitivity to cold 30 days after surgery (P < 0.05), and at the end of the study, that figure had risen to 100% (263) of all teeth included in the sample.

Conclusions: Pulp vitality testing showed that 31.18% (82) of teeth experienced some loss of sensitivity, but by 12 months after surgery, all teeth had recuperated their pulp sensitivity to cold unaided. (Implant Dent 2013;0:1–4)

Key Words: bone graft, mandibular symphysis, morbidity

Most studies on mandibular symphysis grafts focus on the volume of the bone graft itself rather than on the negative consequences that graft harvesting may cause to the donor region or the care that must be taken to avoid them.3,10 Additional studies are needed to accompany and evaluate such alterations.

Accordingly, this prospective study sets out to evaluate the effects chin bone harvesting on the pulp vitality of teeth in the region.

Materials and Methods:

The study sample comprised 30 patients, 22 women and 8 men, with an average age of 45 (ranging from 21 to 65) years, all of whom needed to undergo the harvesting of a chin bone graft to be used in alveolar ridge augmentation before rehabilitation with implant placement. None of the patients had any background of trauma, previous surgery, or alterations to sensitivity in the chin region. Two surgeons conducted the operations using standard surgical techniques.

Surgical Procedure:

The surgical procedure for graft harvesting involved a horizontal incision in the alveolar mucosa in the intercanine region, 5 mm below the mucogingival line. Subsequently, an incision was made through the mentalis muscles on each side and on down to the bone. After raising the mucoperiosteal flap and locating the mental foramina, the osteotomy was carried out using a No.702 cross-cut fissure burr under constant irrigation with 0.9% physiological saline solution. The form of each graft block removed was determined by the reconstruction it was destined for, but in every case, a distance of at least 5 mm was maintained from the roots of the canine teeth, the mental nerves, and the base of the mandible. The final

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removal of the graft block was achieved using chisels. Closure was carried out in 2 stages. The internal sutures consisted of 3 stitches using 3-0 suture catgut (Point Suture, Fortaleza, CE, Brazil) and were designed to achieve precise repositioning of the mentalis muscles. A continuous suture using the same kind of catgut was used for closure of the mucosa. A microporous tape was then placed over the site to minimize edema and hematoma formation. The tape was removed 72 hours later.

Evaluation Method

Assessment of pulp vitality in the mandibular teeth was done by the same person in the preoperative period and in the postoperative period at 1 month, 6 and 12 months. The information obtained was registered in clinical case sheets.

The teeth examined were the mandibular incisors (31, 32, 41, and 42), canines (33 and 43), and premolars (34, 35, 44, and 45), excluding any teeth that showed signs of endodontic treatment, extensive caries, extensive restoration, or prosthetic crowns.

At the stipulated moments, the teeth were individually subjected to cold testing for pulp vitality by touching them with the tip of a cotton swab soaked in “Endo Ice” (Maquira, Curitiba, PR, Brazil) spray refrigerant, producing a local temperature of −50°C, and patients were asked to confirm whether they felt it or not (Fig. 1).

Periapical radiographs were taken of those teeth for which no pulp sensitivity was registered during the 6-month postoperative testing to verify the existence of periapical lesions (Fig. 2), and whenever that was confirmed, the tooth was indicated for endodontic treatment.

Table 1. Total Numbers and Percentages of Teeth With Positive Pulp Sensitivity Responses by Period of Testing

<table>
<thead>
<tr>
<th>Month</th>
<th>Total No. Teeth</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>263 (100%)</td>
</tr>
<tr>
<td>1</td>
<td>261 (98.8%)</td>
</tr>
<tr>
<td>6</td>
<td>234 (88.97)</td>
</tr>
<tr>
<td>12</td>
<td>263 (100%)</td>
</tr>
</tbody>
</table>

*Statistically significant difference from month 0 according to McNemar test (P ≤ 0.05).

Table 2. Numbers of Patients and Percentages of Teeth With Positive Pulp Sensitivity Responses for Teeth 31, 32, 33, 34, and 35, According to Period of Testing

<table>
<thead>
<tr>
<th>Tooth (No. Patients)</th>
<th>Month</th>
<th>31 (n = 30), %</th>
<th>32 (n = 28), %</th>
<th>33 (n = 27), %</th>
<th>34 (n = 25), %</th>
<th>35 (n = 22), %</th>
</tr>
</thead>
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<tr>
<td>0</td>
<td>30 (100)</td>
<td>28 (100)</td>
<td>27 (100)</td>
<td>25 (100)</td>
<td>22 (100)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>17 (56.66)*</td>
<td>14 (50)*</td>
<td>10 (37.03)*</td>
<td>25 (100)</td>
<td>22 (100)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>27 (90)</td>
<td>24 (85.71)</td>
<td>17 (62.96)*</td>
<td>25 (100)</td>
<td>22 (100)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>30 (100)</td>
<td>28 (100)</td>
<td>27 (100)</td>
<td>25 (100)</td>
<td>22 (100)</td>
<td></td>
</tr>
</tbody>
</table>

*Statistically significant difference from month 0 according to McNemar test (P ≤ 0.05).

Table 3. Numbers of Patients and Percentages of Teeth With Positive Pulp Sensitivity Responses for Teeth 41, 42, 43, 44, and 45, According to Period of Testing

<table>
<thead>
<tr>
<th>Tooth (No. Patients)</th>
<th>Month</th>
<th>41 (n = 30), %</th>
<th>42 (n = 27), %</th>
<th>43 (n = 27), %</th>
<th>44 (n = 25), %</th>
<th>45 (n = 22), %</th>
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<tbody>
<tr>
<td>0</td>
<td>30 (100)</td>
<td>27 (100)</td>
<td>27 (100)</td>
<td>24 (100)</td>
<td>23 (100)</td>
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<tr>
<td>1</td>
<td>19 (63.33)*</td>
<td>15 (55)*</td>
<td>12 (44.44)*</td>
<td>24 (100)</td>
<td>23 (100)</td>
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<tr>
<td>6</td>
<td>29 (96.66)</td>
<td>25 (92.59)</td>
<td>18 (66.66)*</td>
<td>24 (100)</td>
<td>23 (100)</td>
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<tr>
<td>12</td>
<td>30 (100)</td>
<td>27 (100)</td>
<td>27 (100)</td>
<td>24 (100)</td>
<td>23 (100)</td>
<td></td>
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</table>

*Statistically significant difference from month 0 according to McNemar test (P ≤ 0.05).
(P < 0.05). At 6 months, however, statistically significant alterations only persisted in the canines (33%–62.96% and 43%–66.66%) (P < 0.05).

Radiographic examinations of teeth that failed to respond to pulp vitality testing 6 months after surgery (11.03%, N = 29) showed that none of them showed any sign of periapical lesions, and by the time, the 12-month postoperative testing was conducted all the teeth in the sample patients responded positively to pulp vitality tests (100%, N = 263).

**Discussion**

The basic aim of dentistry is to restore the patient’s chewing function, and aesthetic and phonetic normality, irrespective of the existence of any atrophy, disease, or lesion in the stomatognathic system.11,12 To that end, despite the possible introduction of some degree of morbidity, the restructuring of atrophied alveolar crests using autogenous bone grafts before rehabilitation with dental implants has become an ideal standard treatment given the outstanding predictability and long-term success of such grafts.1–3,13

In this study, pulp vitality testing conducted 30 days after surgery showed that 68.82% (181) of the teeth tested responded positively whereas 31.18% (82) failed to respond. At 6 months into the postoperative period, however, 88.97% (234) of the teeth responded positively to the test and only 11.03% (29) continued to give no response. Testing 12 months after surgery showed that all the sample teeth (263) responded positively to pulp vitality testing. These findings on alterations to pulp sensitivity subsequent to bone graft removal in this region are corroborated by the similar results obtained by Hoppenreijs et al,9 Nkenke et al,14 Joshi,15 Von Arx et al,4 and Sbordone et al.16 In all their studies, it was shown that teeth with negative responses to pulp sensitivity testing caused by the surgical procedure tend to recover a positive response as the postoperative months go by. However, none of the abovementioned authors report the recovery of a positive response by all the teeth tested, as was the case in the final testing at 12 months in the present study. We believe that those differences can be associated to surgical technique, the amount of bone removed, the instruments used in the osteotomy (eg, quality of the drills and refrigeration), and the depth of osteotomy.

The canines were the only teeth to show persistent statistically significant alterations at the end of the 6-month postoperative period. According to Hoppenreijs et al9 and Nkenke et al,14 they are the teeth most affected by surgery in the mental region because their roots are so much longer than those of the incisors and they limit the dimensions of osteotomies carried out in the region. Studies conducted by Pommer et al17 indicate that a distance of at least 8 mm from the apices of those teeth should be respected. That limits the amount of bony tissue that can be removed and, in many cases, makes it unfeasible to harvest bone grafts from the region.

In this study, no loss of pulp sensitivity was registered for premolar teeth at any period of testing, which leads us to conclude that they are unaffected by mental bone graft harvesting. Similarly, Joshi15 reports no observable loss of pulp sensitivity for those teeth in a study conducted with 27 patients. Conversely, Nkenke et al14 demonstrated that first premolars may show negative pulp sensitivity after the removal of this type of bone graft. According to Von Arx et al18 in the case of teeth that show no loss of sensitivity, there is no significant reduction of blood flow to them stemming from the surgical intervention.

Loss of pulp vitality is a major worry in harvesting bone grafts from the mental region, but the findings of this study show that, provided a distance of at least 5 mm from the apices of the canines is preserved, then any loss of sensitivity is merely transitory and is naturally overcome over a period of 12 months. It is worth highlighting the importance of the periapical radiographic examinations made at the end of the 6-month postoperative period in the case of teeth that are not responding to the pulp vitality test, to identify the possible need for conventional endodontic treatment Teeth examined in that way and that show no lesions should be accompanied for an additional 6 months to confirm that, 12 months after surgery, normal sensitivity has been restored.

**Conclusion**

The pulp vitality testing showed that bone graft harvesting from the mental region caused a loss of sensitivity in 31.18% (82) of the teeth tested and that the canines were the most affected. With the passing of the postoperative months, the percentage gradually dropped, and by 12 months after surgery, all the teeth had recovered their pulp sensitivity unaided.

**Disclosure**

The authors declare the nonexistence of any conflict of interests and that no funding was received from any organization for their work.

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