Ridge preservation in molar sites: a randomized controlled clinical trial

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Introduction

Dimensional shrinkage of the alveolar ridge are unavoidable following tooth extraction, and such changes can affect negatively the treatment for replacing missing teeth. Thus, alveolar ridge preservation (ARP) which counteracts ridge shrinkage, has gained a great attention these days. However, the concrete treatment guideline has yet to be established.

Specifically, the necessity of primary flap closure (PFC) in ARP has been argued in recent years. In conventional ARP, PFC was attempted, but some studies have demonstrated that PFC may be excluded in ARP using resorbable membranes. Considering the shortcomings of PFC, such as increased technical difficulty, patients' discomfort and possible bone loss from tissue management, ARP without PFC, i.e. open healing approach may be more clinician- and patient-friendly modality compared to ARP with PFC.

Materials & Methods

Test Group 1

- DBBM-C
- X suture
- 4 months

Test Group 2

- DBBM-C
- Suture
- 3 months

Control Group

- Control Group
- 1 year follow-up

Figure 1. Simplified diagram of the procedure and flowchart of patient enrollment, randomization, allocation and analyses. Patients were divided into three groups (Test group 1, 2 and control group).

Follow-Up

- 4 Months Recall
- 1 Year-follow-up

Alveolar Ridge Preservation

- Enrolled n=33

Allocated to intervention (n=11)

- TEST GROUP 1 (DBBM-C/DL-CM)
  - Received allocated intervention (n=11)
  - Test Group 1 (DBBM-C only)
    - Received allocated intervention (n=10)
    - Do not fitted in the inclusion criteria at the time of the extraction (bone loss > 50%; n=1)
  - CONTROL GROUP (Natural healing)
    - Received allocated intervention (n=6)
    - Do not fitted in the inclusion criteria at the time of the extraction (bone loss > 50%; n=2)

Follow-Up

- Lost to follow-up (n=0)

Lost to follow-up (n=0)

Analysis

- Marginal bone level
  - Test Group 1
  - Test Group 2
  - Control Group

Figure 2. Clinical photographs showing the procedures of each group.

Results

1. CBCT analysis

<table>
<thead>
<tr>
<th>Test Group 1</th>
<th>Test Group 2</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW 1</td>
<td>0.58 ± 0.63 mm</td>
<td>1.06 ± 1.57 mm</td>
</tr>
<tr>
<td>VHB Test 5</td>
<td>0.25 ± 0.95 mm</td>
<td>1.15 ± 1.63 mm</td>
</tr>
<tr>
<td>VMC Test 5</td>
<td>0.09 ± 0.98 mm</td>
<td>0.82 ± 0.80 mm</td>
</tr>
</tbody>
</table>

Figure 3. Results of CBCT analysis of horizontal change of alveolar ridge after 4 months of ARP. Less horizontal change was noted at all levels in the test group 1, followed by the test group 2 and the control group. The changes at HW 1 and VHB in the control group were statistically greater than those in the test group 2 (P<0.05), but not in the test group 2.

2. Histologic analysis

<table>
<thead>
<tr>
<th>Test Group 1</th>
<th>Test Group 2</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>VHB</td>
<td>16.92%</td>
<td>25.16%</td>
</tr>
<tr>
<td>VMC</td>
<td>11.62%</td>
<td>15.35%</td>
</tr>
<tr>
<td>VHB</td>
<td>18.02%</td>
<td>20.50%</td>
</tr>
</tbody>
</table>

Figure 5. Representative histologic specimen of each group (Masson trichrome staining). Dense collagenous tissue is formed under the epithelium. No distinct difference was observed between the test groups, but pronounced epithelial invagination was shown in the control group. In the test group 2, some bone substitute particles were found in the layer of soft tissue. In test group 1 and 2, newly formed bone surrounded the residual DBBM particles, meanwhile newly formed bone appears to sprout from the underlying native bone. In aspect of relative percentages (%) of hard tissue, test group 1 showed higher percentage of newly formed bone than test group 2, but no statistical difference was shown (P>0.05).

3. Implant-related outcome

100% of survival rate in all groups. Additional GBR in 4 patients

Figure 6. Marginal bone level measurements and changes of Luna® implant at each stage. No statistical difference was shown among three groups (P>0.05).

Conclusion

The study showed better results on the group of ARP in aspect of change of keratinized tissue and radiographic analysis, especially in group of using both DBBM-C and DL-CM. As a result, GBR was performed in 4 patients in the control group. Despite of these differences of results, all implants showed stable state with no complication in post loading 1-year-follow up, whether ARP was conducted or not.

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