

Post-loading 1-year-follow-up of Luna[®] implant after open healing alveolar ridge preservation(ARP) for 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 traumatic tissue management, **ARP without PFC, i.e. open healing approach may be more clinician- and patient-friendly modality compared to ARP with PFC.**

Purpose

The aims of the present randomized controlled clinical trial were:
(1) to radiographically investigate horizontal and vertical ridge alteration after ARP with open healing approach
(2) to appreciate the histologic and histomorphometric soft and hard tissue profiles
(3) to report Luna[®] implant-related outcomes.

Materials & Methods

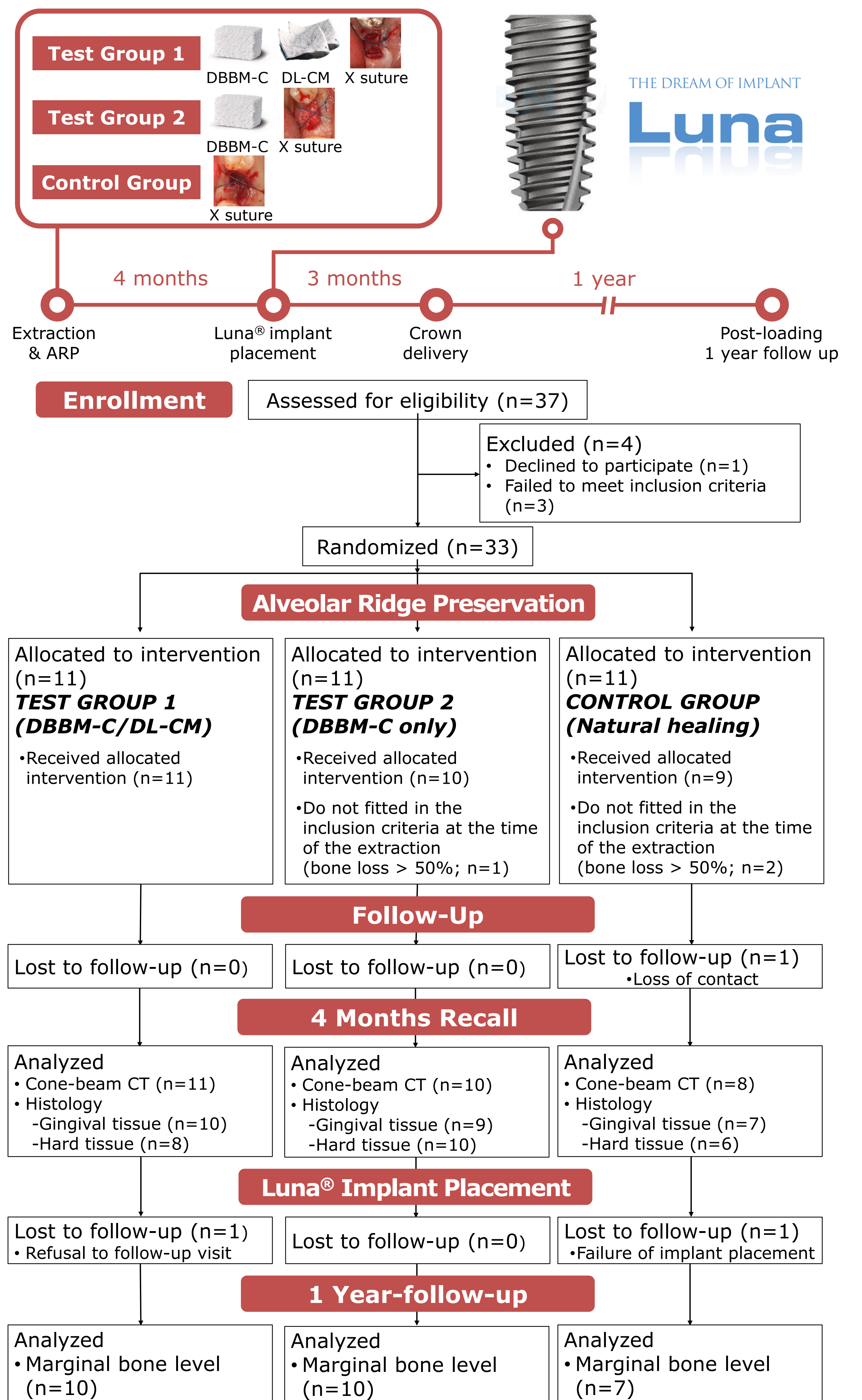


Figure 1. Simplified diagram of the procedure and flowchart of patient enrollment, randomization, allocation and analyses. Patients were divided into three groups (Test group 1, 2 and control group). After 4 months after ARP, radiographic and histological analysis was performed, and Luna[®] implant was placed. Marginal bone level changes of Luna[®] implant was analyzed at post-loading 1 year.
DBBM-C : Deproteinized bovine bone mineral with 10% of collagen
DL-CM : Double layered collagen membrane

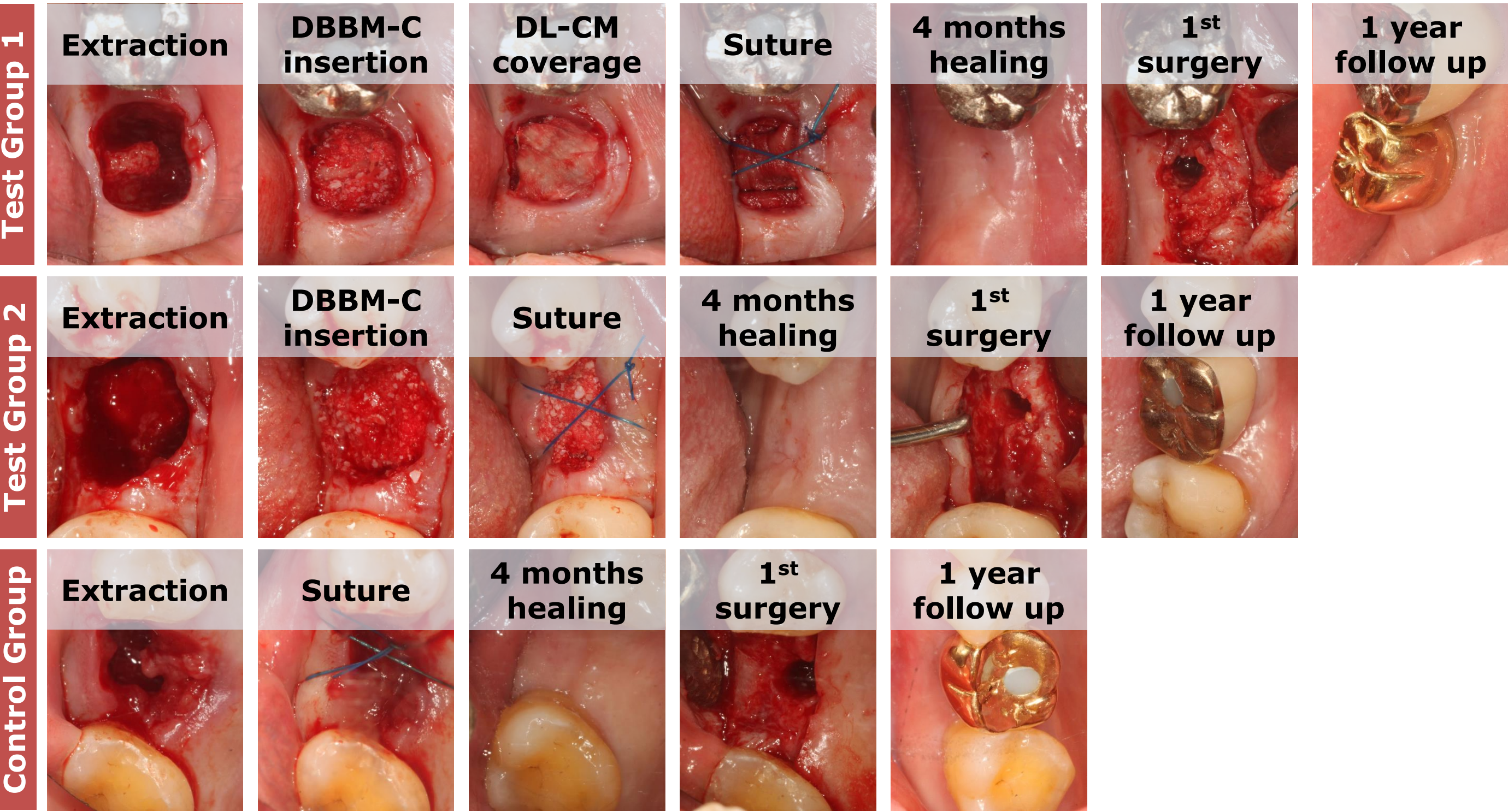


Figure 2. Clinical photographs showing the procedures of each group.

Results

1. CBCT analysis

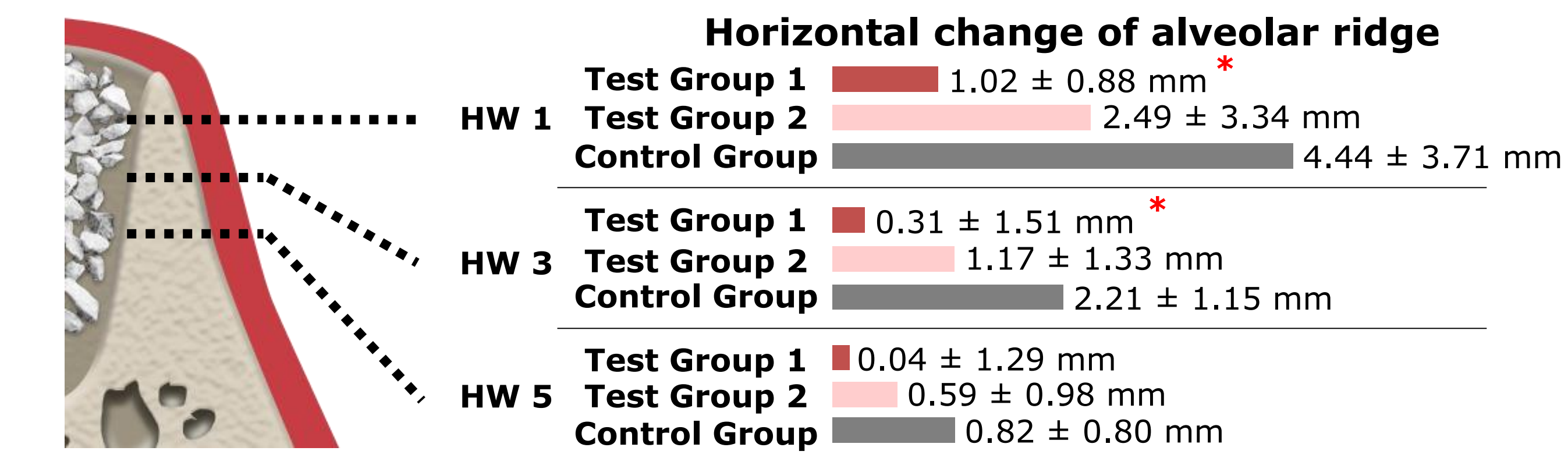


Figure 3. Results of CBCT analysis of horizontal change of alveolar ridge after 4 months of ARP. Less horizontal change was noted at all levels in the test group 1, followed by the test group 2 and the control group. The changes at HW 1 and HW 3 in the control group were statistically greater than those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

HW 1, 3 and 5 : Change in horizontal ridge width at 1, 3 and 5 mm level below the ridge crest
* : Statistically significant compared to the control group

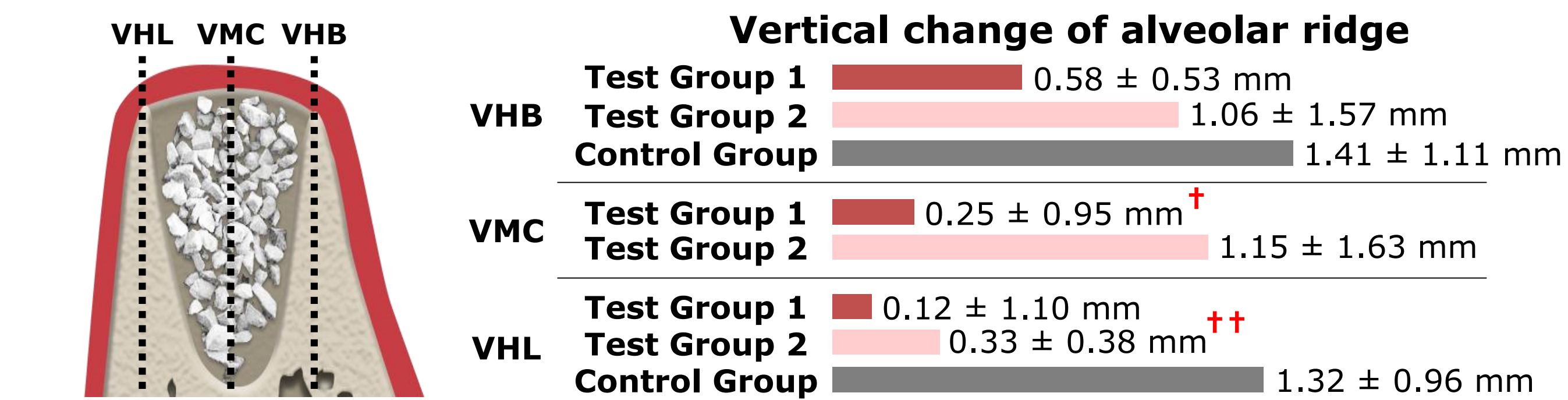


Figure 4. Results of CBCT analysis of vertical change of alveolar ridge after 4 months of ARP. Vertical changes at all measuring points were smallest in the test group 1, followed by the test group 2 and the control group. Statistically significant difference was found in VMC between the test group 1 and test group 2, and in VHL between the test group2 and the control group($P<0.05$).

VHB, VMC and VHL : Change in the vertical height of ridge at buccal, mid and lingual crest
+ : Statistically significant compared to the test group 2 ++ : Statistically significant compared to the control group

2. Histologic analysis

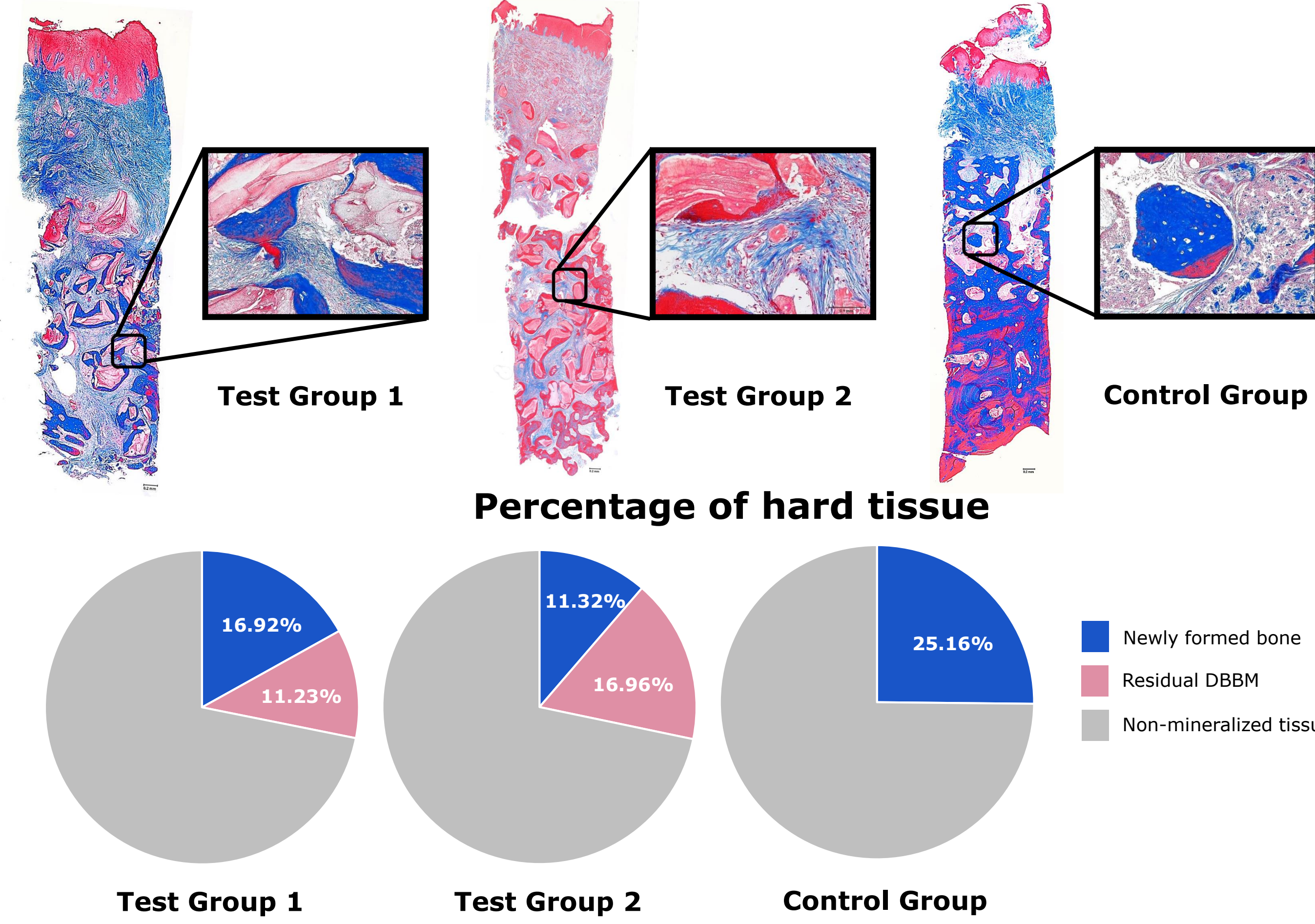


Figure 5. Representative histologic specimen of each group (Masson trichrome staining). Dense collagenous tissue is formed under the epithelium. No distinct difference was observed between two test groups, but pronounce epithelial invagination was shown in the control group. In the test group 2, some of bone substitute particles were found in the layer of soft tissue. In test group 1 and 2, newly formed bone surrounds 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

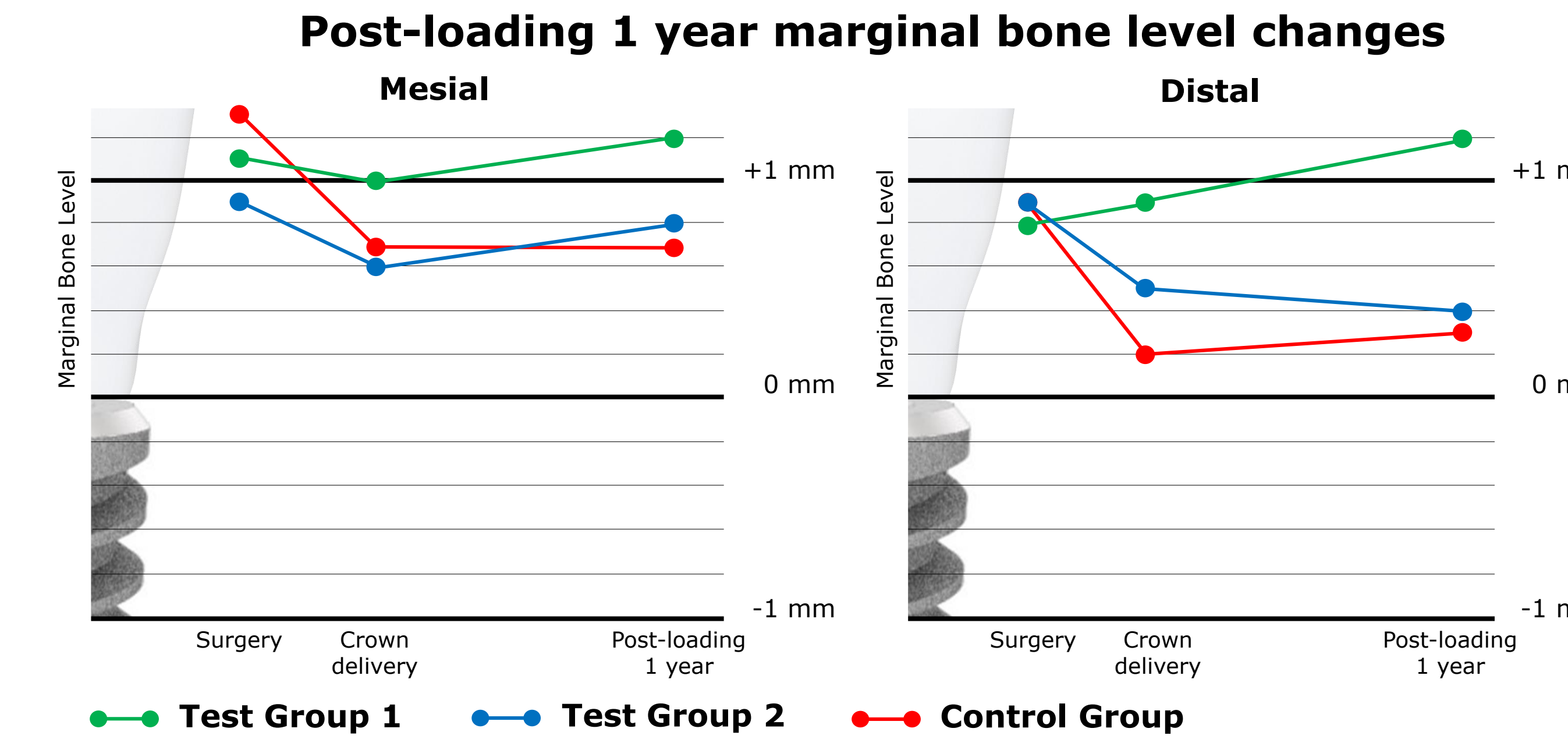
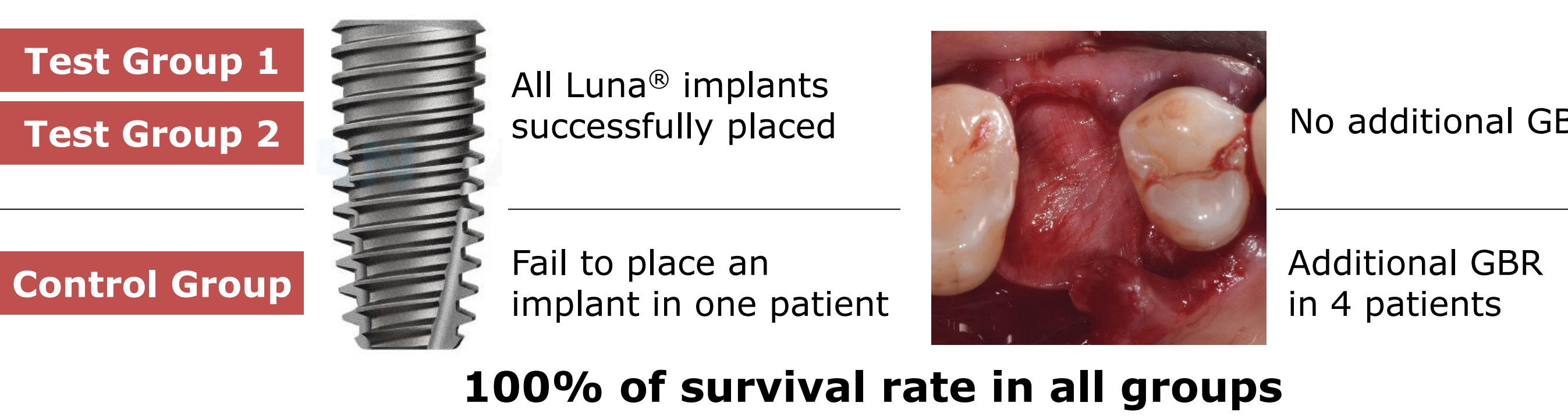


Figure 6. Marginal bone level measurements and changes of Luna[®] implant at each stage. No statistical difference was shown among three groups($P<0.05$).

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, and it is proved that **Luna[®] implant will lead to successful results regardless of ARP or other GBR.**