

Long-term preservation of ridge dimension following tooth extraction and ridge preservation: A randomized controlled trial of healing at 4-month and 12-month healing time points

Purpose: Some patients may be unable to have a dental implant placed shortly after extraction and ridge preservation due to financial, personal or other reasons. The efficacy of ridge preservation in maintenance of alveolar ridge dimension beyond 6 months after treatment is unknown. The primary purpose of this study was to compare the differences in alveolar ridge dimensional change following ridge preservation between 4-month and 12-month healing time points.

Methods and Materials: 35 patients planned for extraction of a single tooth and subsequent implant placement were enrolled in the study. Patients underwent atraumatic tooth extraction and ridge preservation using 70% mineralized/30% demineralized freeze-dried bone allograft and a non-resorbable dense polytetrafluoroethylene (dPTFE) membrane. To eliminate variability in the graft material, all patients received allograft from the same tissue donor. Subsequently, patients were randomized into two treatment groups: short-term healing group (ST) and long-term healing group (LT). Within 72 hours of extraction, all patients received radiographic examination via cone beam computed tomography (CBCT) with a resin stent containing a fixed radiographic marker. Implant placement for ST patients and LT patient took place at approximately 4 months and 12 months, respectively, following ridge preservation. A second CBCT was taken shortly before implant placement. Measurements including alveolar ridge height and width were made radiographically using the standardized radiographic marker. Statistical analysis was completed on the radiographic data using student's unpaired two-sample t-tests at $\alpha=0.05$. Analyses were performed using GraphPad Prism statistical software.

Results: 35 patients completed the study, 18 in the ST group and 17 in the LT group. No statistically significant differences were detected in the change of alveolar ridge height, measured at the buccal and lingual crest heights, between the ST and LT groups. Buccal ridge height showed a mean loss of 1.5 mm in the ST group and 0.9 mm in the LT group ($p=0.21$), while lingual ridge height loss

measured 1.4 mm in the ST group and 1.3 mm in the LT group ($p=0.82$). Similarly, no statistically significant differences were detected in the change of alveolar ridge width at 3 mm, 5 mm, and 7 mm apical to the original ridge crest height between the ST and LT groups. Average ridge width change 3 mm apical to the original crest height for the ST and LT groups were a mean loss of 2.3 and 2.9 mm respectively ($p=0.22$). Mean ridge width loss at a point 5 mm apical to the crest was 1.3 mm for the ST group and 1.8 mm for the LT group ($p=0.19$). Finally, an average ridge width change of 0.9 mm for the ST group and 1.3 mm for the LT group was seen 7 mm apical to the original crest ($p=0.23$).

Discussion: Previously, the effect of time on histologic wound healing following ridge preservation has been evaluated. However, no clinical trials have evaluated the effect of extended healing time on alveolar dimensional changes. This study demonstrates that there is no significant difference in alveolar ridge dimensional changes between the ST and LT groups. This is clinically relevant in regard to treatment planning for patients who may require an increased healing time between ridge preservation and implant placement.

Conclusions: The efficacy of ridge preservation in the maintenance of ridge width and height at the 12-month time point is similar to that of the 4-month time point. Clinicians may feel confident that a delay in implant placement for up to a year has no significant negative impact on the height and width of the healed ridge.