

Ridge Augmentation in the Esthetic Zone to Achieve Prosthetically Guided Implant Positioning



By: Dr. Edward Gottesman, DDS

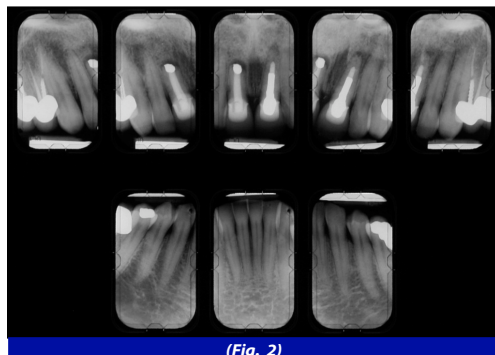
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neighboring teeth was recommended prior to placing dental implants.

Shown in **Figure 1** are the appearance of the second set of all-ceramic crowns on teeth #s 8 and 9 prior to referral to our office. **Figure 2** is the full-mouth radiographic series from November 2004 displaying periapical radiolucencies on endodontically treated #s 8 and 9 and retrofill amalgam #8.



(Fig. 1)



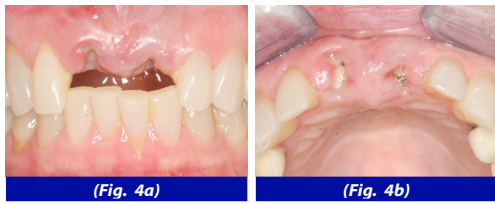
(Fig. 2)

Using an in-situ gingival augmentation technique first described in 1994 by Langer¹, the prosthodontist de-coronated the clinical crowns of #s 8 and 9 (**Figure 3**) with the intent of promoting epithelial migration over the ridge to help obtain primary closure for the intended extraction and simultaneous augmentation procedures to be performed by the periodontist.



(Fig. 3)

Upon the patient's initial presentation to our office two weeks later, her soft tissues had indeed migrated with nearly complete flap closure achieved over the roots (**Figure 4**). **Figure 5** shows the acrylic partial denture fabricated by the prosthodontist.



(Fig. 4a)

(Fig. 4b)

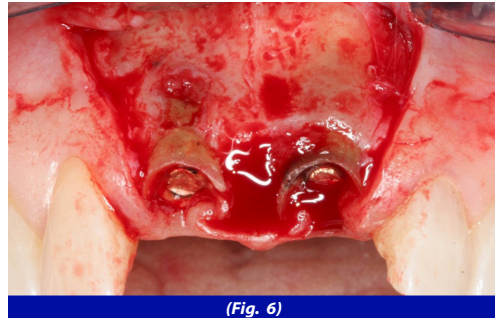


(Fig. 5)

Ridge augmentation method

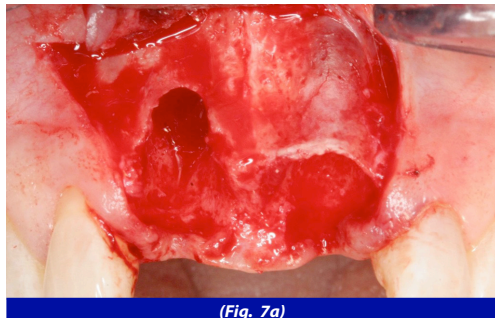
A guided GBR procedure to augment the alveolar ridge was performed prior to dental implant placement. Five 1.8-mL carpules of Xylocaine® (Lidocaine Viscous) 2% with 1:100,000 epinephrine and two 1.8-mL carpules Xylocaine® with 1:50,000 epinephrine were administered as facial infiltrations in positions # 6-11, in addition to a nasopalatine block to obtain profound anesthesia in the anterior maxilla. A full-thickness mucoperiosteal flap was elevated with vertical incisions extending apically from the distal line angles of teeth #s 8 and 9 to beyond the

mucogingival junction. **Figure 6** shows the loss of facial cortical plate on #8, fistula, and thin facial bone on both teeth. The darkening of the root of #9 is apparent (as in **Figure 1** also).

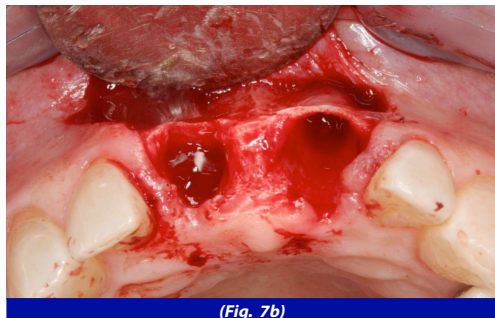


(Fig. 6)

Atraumatic extraction with delicate technique using periostomes is critical in such a situation, in order to preserve the thin facial plate on #9. **Figure 7** shows facial and occlusal views of the ridge architecture immediately post-extraction, including the dehiscence-type defect in position #8, and preservation of the thin facial cortical plate in position #9.



(Fig. 7a)



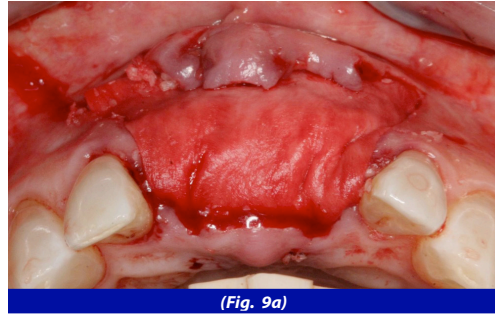
(Fig. 7b)

The extraction sockets were then packed with a freeze-dried cortical bone allograft (Musculoskeletal Transplant Foundation, Edison, NJ). Considerable overfill of the graft site was achieved to compensate for settling and remodeling of the graft during the healing period (**Figure 8**).

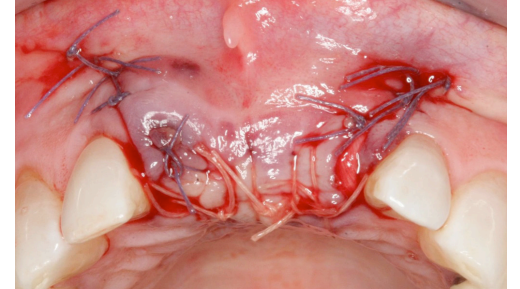


(Fig. 8)

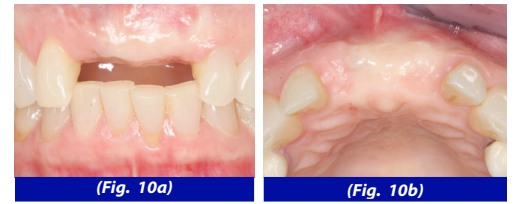
A resorbable type-I porcine collagen membrane (BioGide®; Osteohealth, Shirley, NY) was placed (**Figure 9**), and secured beneath the soft-tissue margins of the graft site to stabilize the particulate bone graft material and to provide space for selective repopulation of the site with osteoblasts, while excluding the epithelial cell proliferation. Primary closure was accomplished with 5-0 Vicryl® sutures (Ethicon, Raritan, NJ). **Figure 10** shows facial, occlusal and periapical radiographic views of healing at two



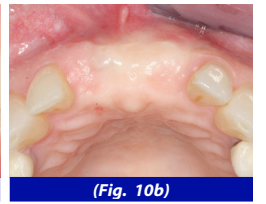
(Fig. 9a)



(Fig. 9b)



(Fig. 10a)



(Fig. 10b)



(Fig. 10c)

months postoperatively, demonstrating good preservation of the bony and soft-tissue ridge volume.

In preparing for the implant surgical phase, a surgical guide from orthodontic resin (**Figure 11**) was fabricated by the prosthodontist to aid in appropriate alignment of the proposed implants and restorations. A full-thickness flap was elevated facially and palatally, using papillary-sparing incisions on teeth #s 7 and 10 to avoid further gingival recession (**Figure 12**). Excellent consolidation of the bone graft and facial-lingual ridge profile was also observed upon re-exposure of the graft site.

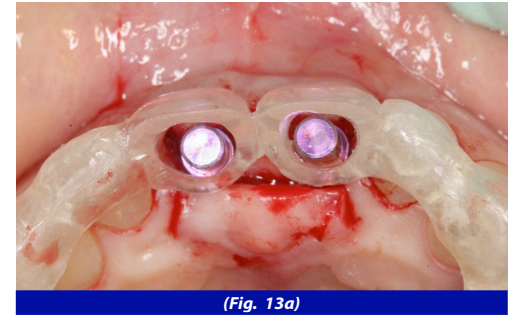


(Fig. 11)

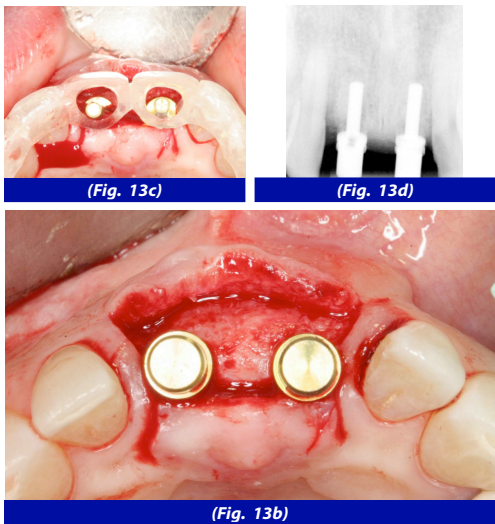


(Fig. 12)

Figure 13 demonstrates 3.5-mm and 4.3-mm guide pins being used in the pilot osteotomies to gauge the distance between the implants and the proximal teeth so as to determine whether 3.5-mm or 4.3-mm diameter implants should be utilized. Regular platform, 4.3-mm X 13-mm Nobel Replace®, Tapered Groovy implants (Nobel Biocare, Goteborg, Sweden) were selected, as enough bone existed to support that implant diameter at the crest. In this case, the appropriate

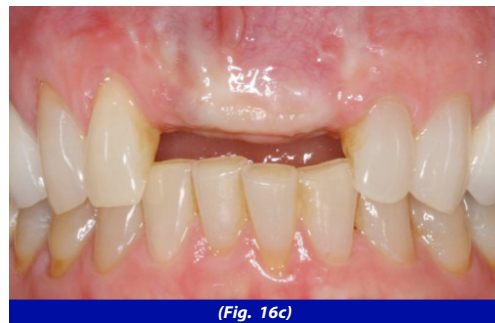
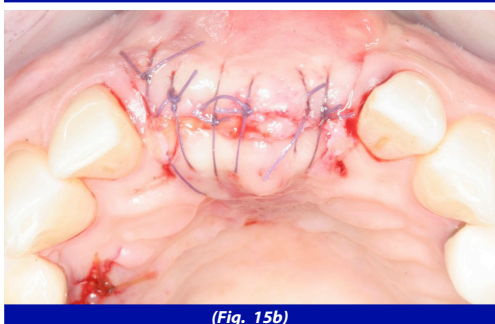
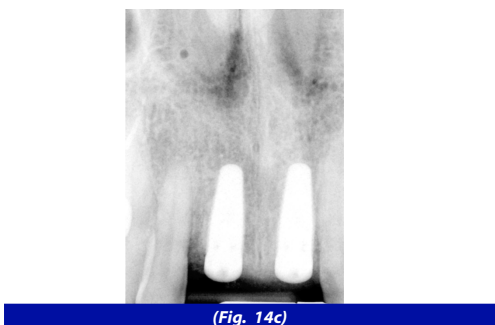
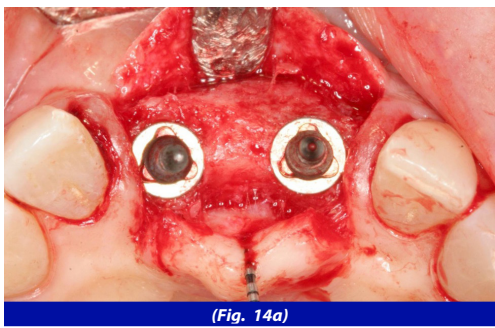


(Fig. 13a)



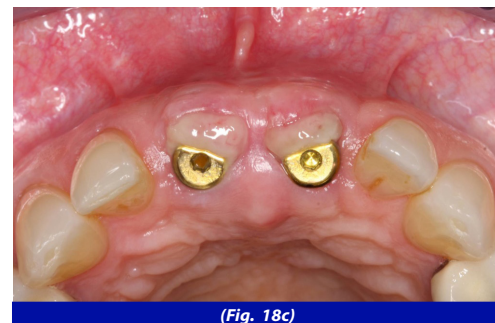
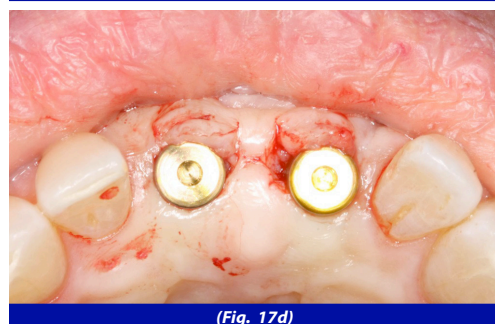
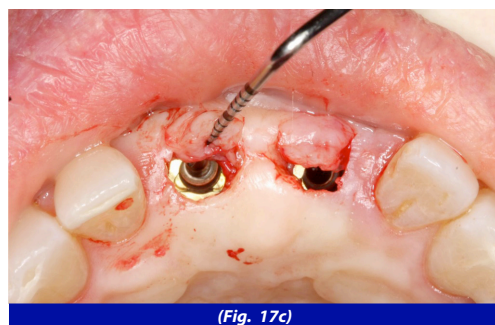
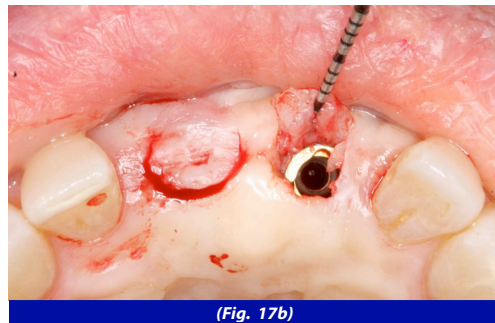
distance, position and angles were determined to facilitate emergence of the implant through the cingulum area of the proposed restoration form, ie, toward lingual aspect of the incisal edge. Also shown are guide pins seated in inverted positions in the pilot osteotomies to confirm their centralized positions relative to facial and palatal margins of the planned restorations. **Figure 14** shows incisal views and a periapical radiographic view of the 4.3-mm 13-mm diameter Nobel Replace® Tapered Groovy implants placed at the level of the newly-augmented ridge (no threads visible) and their alignment with the surgical guide. Finally, a connective tissue autograft harvested from the palate was placed over the implants, and near-primary closure was achieved with 5-0 Vicryl sutures (**Figure 15**). **Figure 16** shows the soft tissues pre-operatively, and at 2 and 4+ months post-operatively after submerging the implants.

Next, the implants were uncovered after 4 months by performing two semilunar incisions.



The tissue was advanced from the mid-crest toward the facial in conjunction with these incisions, and healing abutments were placed (**Figure 17**). **Figure 18** shows the immediate post-operative facial advancement of the crestal tissue, as well as healing of the facially displaced tissue at 1 week.

The next phase of treatment consisted



of provisionalization and restoration of the implants. An implant fixture-level impression was obtained (**Figure 19a**), and at a subsequent appointment, two temporary non-engaging titanium abutments (Nobel Replace RP) were used to convert the acrylic partial denture to a splinted acrylic screw-retained provisional (**Figure 19b**). The overall goal was to sculpt the tissue for a more natural form and to contour the emergence profile in preparation for the final crowns (**Figure 19c**). Approximately 3 weeks later, papilla formation was observed, as healing and tissue remodeling progressed (**Figure 20**). Finally, a white wax mock-up was tried in to determine necessary modifications with the patient's input regarding shape and length. Two individual screw-retained Procera® (Nobel Biocare) zirconia crowns layered with NobelRondo® (Nobel Biocare) veneering porcelain were torqued down to 35 Ncm (**Figures 21 and 22**).

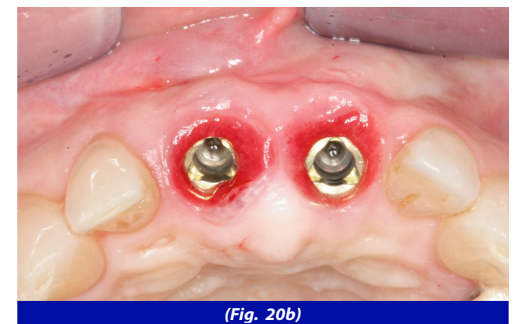
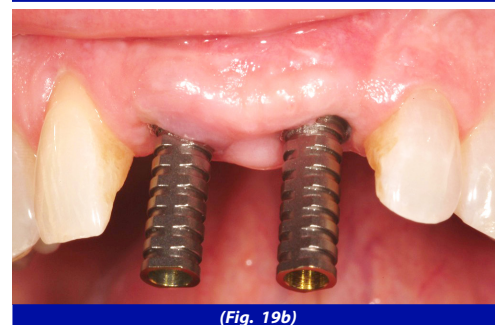
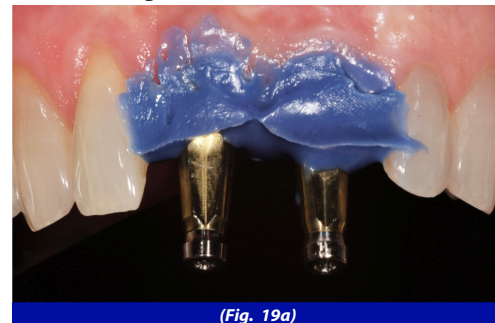
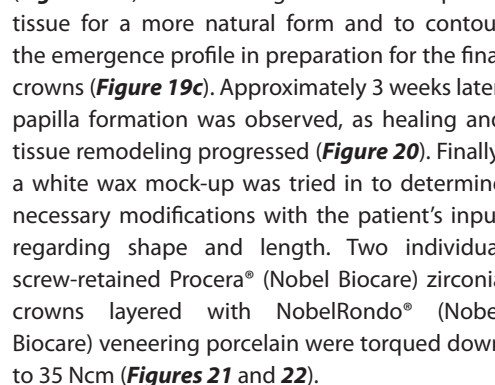


Figure 1. All-ceramic crowns (second set), teeth #s 8 and 9 prior to referral to our office.

Figure 2. Full-mouth radiographic series from November 2004; note periapical radiolucencies on endodontically treated #s 8 and 9 and retrofill amalgam, #8.

Figure 3. De-coronated clinical crowns of #s 8 and 9, performed by prosthodontist (note persistent fistula, #8).

Figure 4a. Facial view of migrated soft tissue, with nearly complete flap closure achieved over the roots; **Figure 4b,** incisal view.

Figure 5. Acrylic partial denture fabricated by the prosthodontist.

Figure 6. Full-thickness flap exposure showing loss of facial cortical plate and fistula, #8, thin facial bone on both teeth, darkening of root, #9.

Figure 7a. Facial view, ridge architecture immediately post-extraction: dehiscence-type defect, position #8, preservation of thin facial cortical plate, position #9; **Figure 7b.** Incisal view.

Figure 8. Freeze-dried cortical bone allograft, overfilled to compensate for settling and remodeling during healing

Figure 9a. Resorbable type-I porcine collagen membrane placed over allograft; **Figure 9b.** Primary closure with 5-0 Vicryl sutures.

Figure 10a. Facial, of healing at two months postoperatively, demonstrating good preservation of bony and soft-tissue ridge volume; **Figure 10b,** incisal/occlusal view; **Figure 10c.** periapical radiographic view.

Figure 11. Surgical guide (orthodontic resin) fabricated by the prosthodontist, in preparation for implant surgical phase.

Figure 12. Full-thickness flap with papillary-sparing incisions on teeth #s 7 and 10; excellent consolidation of bone graft, facial-lingual ridge profile.

Figure 13a. Guide pins (3.5-mm) and in pilot osteotomies to gauge the distance between implants and proximal teeth and assess appropriate implant diameter. **Figure 13b.** Guide pins (4.3-mm); **Figure 13c.** Guide pins (4.3 mm) seated in inverted positions in pilot osteotomies to confirm positions relative to planned restorations;

Figure 13d. Periapical radiographic view, 4.3 mm)

Figure 14a. Incisal view, 4.3-mm 13-mm diameter Nobel Replace® Tapered Groovy implants placed at the level of the newly-augmented ridge; **Figure 14b.** Alignment with the surgical guide. **Figure 14c.** Periapical radiographic view of implants.

Figure 15a. Palatal connective tissue autograft placed over implants; **Figure 15b.** Near-primary closure with 5-0 Vicryl sutures.

Figure 16a. Soft tissues pre-operatively; **Figure 16b.** 2 months postoperatively; **Figure 16c.** 4+ months post-operatively, after submerging implants.

Figure 17a. Semilunar incisions;

Figure 17b, Figure 17c. Tissue advancement facially from mid-crest;

Figure 17d. Healing abutments placed; **Figure 17e.** Periapical radiographic view after soft-tissue repositioning.

Figure 18a. Facial advancement of crestal tissue immediately postoperatively; **Figure 18b.** Facial view, healing of facially displaced tissue at 1 week;

Figure 18c. Incisal view at 1 week.

Figure 19a. Implant fixture-level impression;

Figure 19b. Two temporary non-engaging titanium abutments (Nobel Replace RP) to convert the acrylic partial denture to a splinted acrylic screw-retained provisional;

Figure 19c. Facial view, contouring of provisional crowns' emergence profile in preparation for final crowns; **Figure 19d.** Incisal view.

Figure 20a. Facial view, papilla formation at 3 weeks; **Figure 20b.** Incisal view; **Figures 20c, 20d.** Provisional crowns in place against newly-remodeled tissue.

Figure 21a. Wax mock-up tried in to determine necessary modifications with patient input on shape and length; **Figure 21b.** Final screw-retained Procera® zirconia crowns layered with NobelRondo® veneering porcelain in place, torqued down to 35 Ncm.

Figures 22a, 22b, 22c. Lipline/esthetic views of final restorations.

REFERENCE

(1) Langer B. Spontaneous in situ gingival augmentation. *Int J Periodontics Restorative Dent.* 1994; 14(6):524-535.

Discussion and Conclusions

Hard- and soft-tissue esthetic management during tooth replacement with implants often demands a stepwise, integrated treatment approach over time. In this case, GBR was used as a foundation on which to rebuild an alveolar ridge that had become extremely fragile, enabling close-to-ideal placement of implants. Then, as separate procedures, soft tissue grafting, tissue advancement and provisionalization were used integrally to augment and restructure soft tissue in order to recreate lost gingival architecture. This interdisciplinary sequence highlights the significance of well-planned provisionalization as an integral step in the esthetic tissue remodeling process prior to placement of the final restorations. It also emphasizes the significance of collaboration between the periodontist and prosthodontist in order to obtain an optimal anatomic, functional and esthetic result for the patient.

All restorative dentistry as well as photographs of crowns, provisionals and implant restorations performed by Debra H. Cohn, D.D.S. (Clinical Associate Professor, Advanced Education Department of Prosthodontics, New York University College of Dentistry; Private practice, New York, NY, USA)