Extraction with Immediate Implant Placement and Ridge Preservation in the Posterior

by *Timothy F. Kosinski, DDS, MAGD*

The following case presentation illustrates the diagnosis, planning and treatment for the extraction of maxillary left first and second bicuspids with immediate placement of Hahn™ Tapered Implants (Glidewell Direct; Irvine, Calif.). Following atraumatic extraction, we perform a conservative envelope flap to evaluate bone contours in the socket sites, utilize mineralized cortico/cancelleous allograft material and a resorbable membrane to augment the ridge and repair the facial and socket defects, and place the implants — all within the same appointment.

The Hahn Tapered Implants achieve excellent primary stability in the extraction sites by engaging new bone beyond the apices of the socket. The defects are predictably repaired over time, during which custom titanium abutments and final BruxZir® Full-Strength Solid Zirconia crowns are fabricated. The treatment plan is prosthetically driven, meaning that we position the implants to support a restoration that most predictably mimics the natural teeth. Our goal with this case is to maintain bone levels around the implants, optimize soft-tissue contours and periodontal health, and facilitate easy maintenance with proper home care.

CASE REPORT

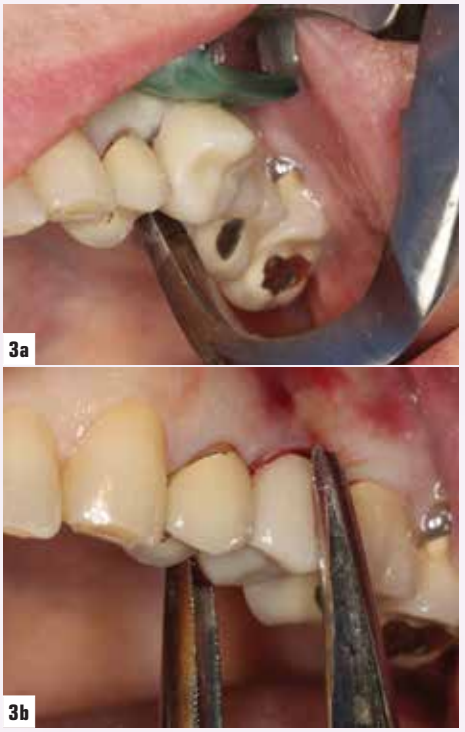
A 61-year-old female presented to the practice with symptomatic maxillary left first and second bicuspids with failing endodontic treatment. The porcelain of the old PFM crowns had fractured *(Figs. 1a, 1b)*. Endodontic evaluation indicated fractures and a poor prognosis for further treatment of the teeth *(Fig. 2)*. The patient reported controlled hypertension and anemia. With no contraindications present, the patient was treatment-planned for extractions, grafting and dental implant placement.

Surgical Procedure

Physics Forceps® (Golden Dental Solutions; Roseville, Mich.) were used to atraumatically remove the bicuspid teeth *(Figs. 3a, 3b)*. The "beak," or shovel-shaped edge, of the instrument engaged the palatal surface of the root 1–3 mm subgingivally. The "bumper" was placed onto the facial aspect of the tooth to be removed as high up the vestibule as possible. The bumper is not a working end of the instrument but rather acts as a fulcrum or center of rotation for the beak. Simple wrist rotation created tension on the palatal root surface. This tension created energy resulting in a physiologic enzymatic response, breaking down the periodontal ligaments. No squeezing occurred during this process; rather, simple rotational force was applied. The tooth was lifted up and out of the socket, thus maintaining the facial plate of bone. The instrument is intended not to remove the tooth in total, but rather, to luxate it. A tooth delivery instrument was then used to remove the root structure in total.

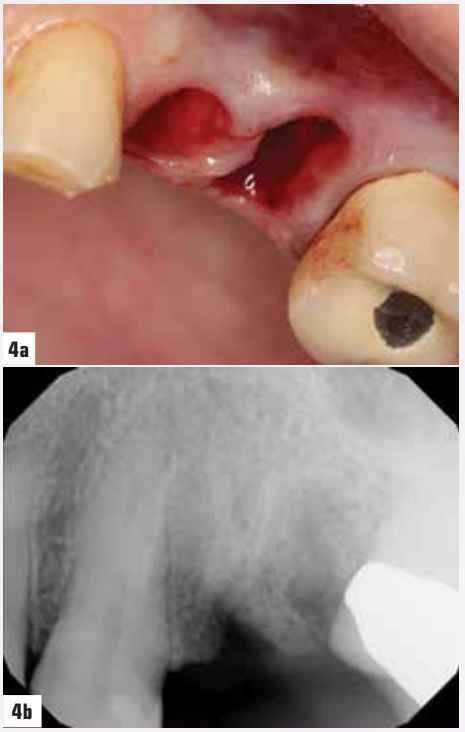
Visual observation and digital radiography demonstrated that the atraumatic extractions resulted in intact socket sites *(Figs. 4a, 4b)*. However, after more intensive evaluation, it was apparent that there were facial defects on the walls of the socket sites caused by the root fracture and subsequent

Figures 1a, 1b: *The patient presented with symptomatic maxillary left first and second bicuspids.*



Figures 3a, 3b: *Physics Forceps were used for atraumatic removal of the bicuspid teeth. The instrument ensures that the tooth lifts up and out of the socket, thus maintaining the facial plate of bone.*

Figure 2: *The endodontic evaluation revealed that both teeth were untreatable, with horizontal fracture at the post of the first bicuspid and vertical fracture of the second bicuspid.*



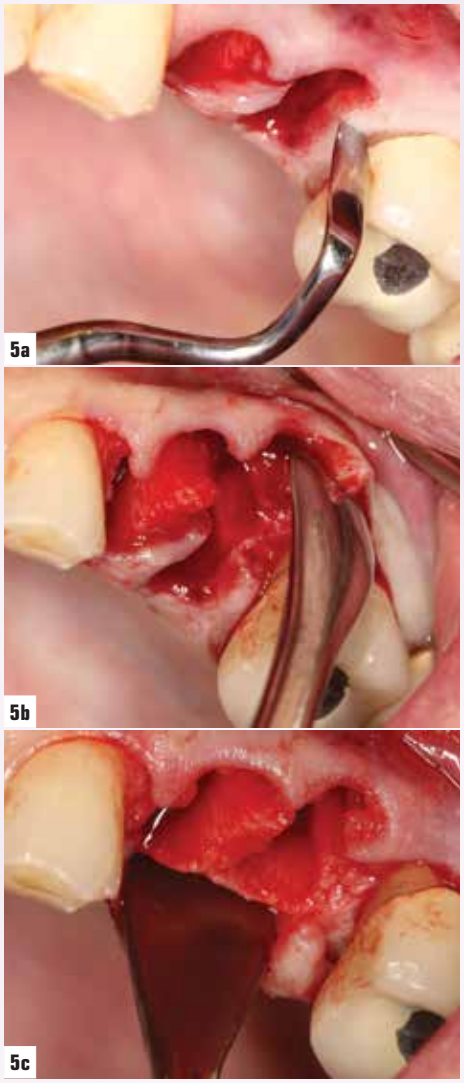
Figures 4a, 4b: *Visual observation and the digital radiograph appeared to indicate intact socket sites.*

bone loss. An Orban knife was used to create a controlled incision, and an envelope flap was created *(Figs. 5a–5c)*. A periosteal elevator was used to move the attached gingiva facially, exposing the boney defects, and the palatal attached gingiva was also relieved. This was an important step to help maintain a passive position for subsequent placement of the protective membrane.

The allograft material was dispensed into a sterile dappen dish. Newport Biologics™ Mineralized Cortico/Cancellous Allograft Blend (Glidewell Direct; Irvine, Calif.) is well-suited for this situation, as the range of particle sizes allows for a mixed resorption rate by the osteoclasts responsible for bone growth and healing. I prefer to wet the allograft material with sterile water *(Fig. 6)*. This allows for an ideal handling characteristic when transferring the graft material to the surgical site. Then we trimmed the membrane to a size that covered the defect and engaged healthy bone more than 2 mm past any defect on the facial and palatal aspect.

Osteotomies were formed for two 4.3-mm-diameter Hahn Tapered Implants in the areas of tooth #12 and #13. A 2.4 mm twist drill was used to create the initial openings into the bone, on the palatal aspects of the sockets. Because some bone recontouring at the crest of the ridge is expected in an immediate extraction site, the osteotomies were created at a depth to position the implants about 1 mm subcrestally into the socket. The twist drill was used to establish ideal mesial-distal angulation and proper depth *(Fig. 7)*.

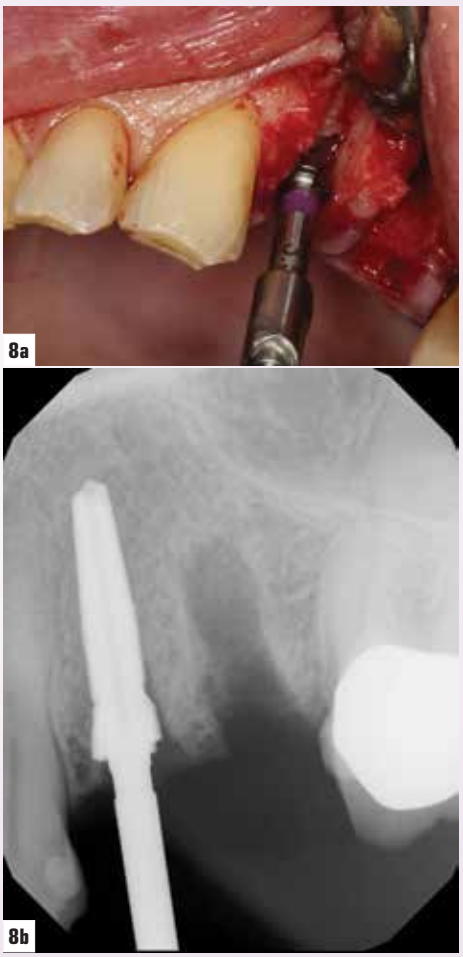
The 3.5-mm-diameter shaping drill was used to widen the sites, and a radiograph was taken to ensure proper positioning *(Figs. 8a, 8b)*. The osteotomies were completed with the 4.3-mm-diameter shaping drill *(Fig. 9)*. A 13-mm-long implant was placed in the area of the maxillary



Figures 5a–5c: *Upon more intensive evaluation, it was apparent that there were facial defects caused by root fracture and subsequent bone loss, which needed to be addressed. A controlled incision was made, an envelope flap was created and the boney defects were exposed.*

Figure 6: *Mineralized cortico/cancellous allograft material was placed into a sterile dappen dish and hydrated.*

Figure 7: *A twist drill was used to initiate the osteotomies at the proper depth and mesial-distal angulation.*



Figures 8a, 8b: *A 3.5-mm-diameter shaping drill was used to widen each site, and proper positioning was confirmed with a radiograph.*

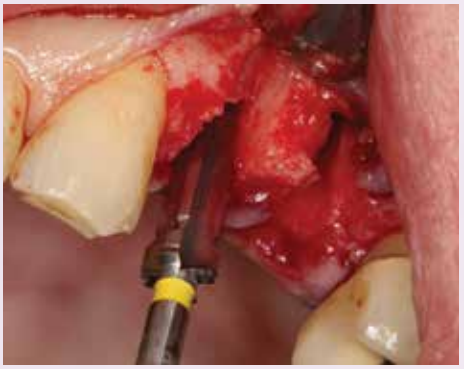


Figure 9: *A 4.3-mm-diameter shaping drill was used to complete the osteotomies.*

Figure 10: *A 13-mm-long Hahn Tapered Implant was placed in the area of the maxillary first bicuspid.*

first bicuspid *(Fig. 10)*. Digital radiography confirmed the slightly subcrestal placement of the implant into the socket. A 4.3 mm x 11.5 mm Hahn Tapered Implant was placed in the maxillary second bicuspid site. After threading the implants into position, the facial bone defects were evident *(Fig. 11)*. The defects would be corrected using the allograft material and resorbable membrane.

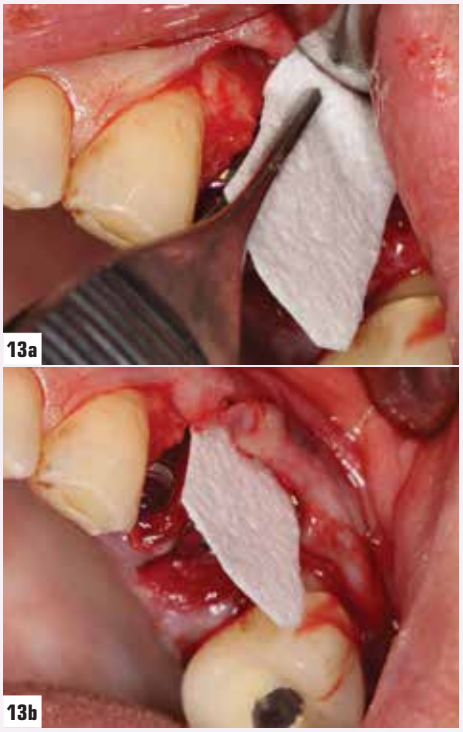
The tapered shape and aggressive thread design of the Hahn Tapered Implants helped achieve primary stability of 40 Ncm. Cover screws were hand-tightened into place, which allowed for the folding of the resorbable membrane over the crest of the ridge to protect the graft material on the facial aspect of the implant site. A significant gap between the stable implants and the boney walls of the alveolus was noted *(Fig. 12)*.

Bone Grafting Technique

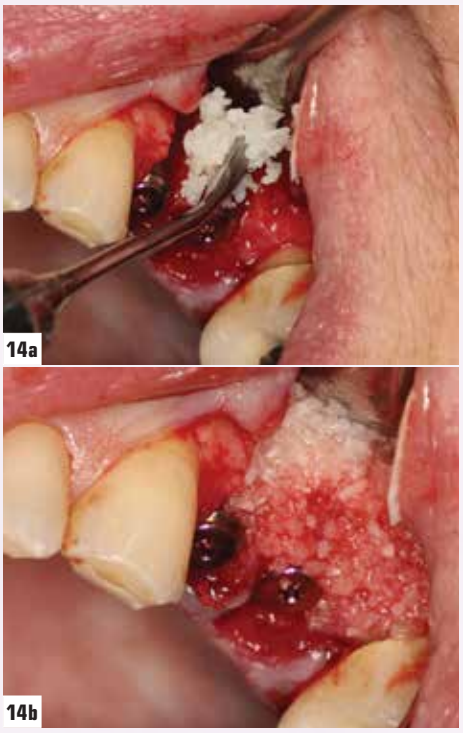
For proper control when placing the bone graft particles, the membrane was passively positioned 2 mm or more past the most apical portion of the facial defects *(Figs. 13a, 13b)*. For this reason, it was imperative that the envelope flap extend significantly beyond the facial defect. I have found that the main error in membrane placement is trying to force the resilient material into a space that will not allow it to seat easily.

Figure 11: *After an 11.5 mm Hahn Tapered Implant was placed in the maxillary second bicuspid site, the presence of facial defects was noted.*

Figure 12: *The occlusal view shows the significant defects around the Hahn Tapered Implants, which achieved primary stability of 40 Ncm. Note that the placement of cover screws allows the membrane to be folded over the crest of the ridge to protect the graft material.*



Figures 13a, 13b: *The resorbable membrane was passively positioned.*



Figures 14a, 14b: *Hydrated mineralized cortico/cancellous allograft material was placed between the implants and the membrane. Newport Biologics Mineralized Cortico/Cancellous Allograft Blend is well-suited for this situation, as the range of particle sizes allows for a mixed resorption rate.*

To maintain consistent bone volume, the mineralized cortico/cancellous allograft material, hydrated with sterile saline to create a paste-like mixture, was placed between the implants and the facially positioned membrane *(Figs. 14a, 14b)*. The membrane was simply tucked over the surgical site to engage the palatal bone a minimum of 2 mm apically *(Fig. 15)*.

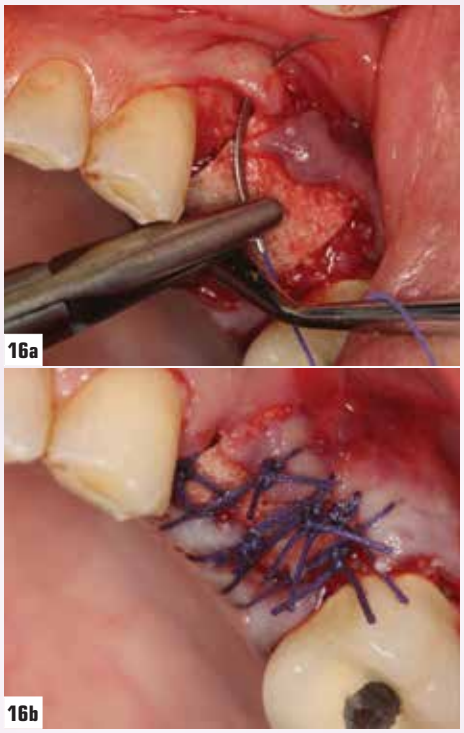
Suturing a membrane graft can be challenging. The cutting needle sometimes grabs onto the membrane and dislodges it. I have found the technique of taking the needle from the crestal to the facial and then reversing the needle and engaging tissue from the crestal to the palatal to be efficient. A reverse bevel helped avoid catching the membrane as the surgical site was sutured *(Figs. 16a, 16b)*.

Postoperative Process

The postoperative CBCT scan performed using the PaX-i3D Green imaging system (Vatech America; Fort Lee, N.J.) indicated that the two implants were optimally positioned *(Fig. 17)*. The sutures were removed after approximately seven days, and the implant sites were allowed to heal for another four months. The patient then presented for final impressions *(Fig. 18)*. The transfer copings engaged the inside of the implants, and a radiograph was taken to make sure the metal-to-metal components seated properly. Note that there was an excellent band of attached gingiva on the facial aspect of the implants, and the bone contour appeared to be proper. The final impression was made using vinyl polysiloxane material. From this impression, a master cast was made and Glidewell Laboratories fabricated custom titanium abutments *(Fig. 19)*. The final single-unit crowns were digitally designed and milled from BruxZir Full-Strength Solid Zirconia *(Fig. 20)*.

The custom-milled titanium abutments were threaded into position in

Figure 15: *The membrane was passively placed over the ridge and implants.*



Figures 16a, 16b: *A careful suturing technique ensured that the membrane did not become dislodged. The sutures were tightened, and allowed for a portion of the membrane to be visible.*

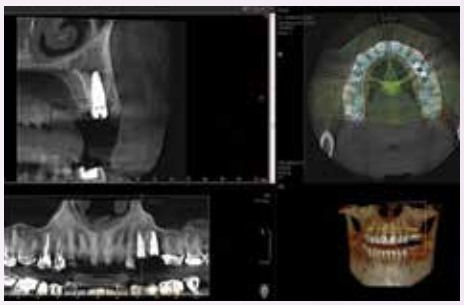


Figure 17: *The postoperative CBCT imagery indicated that the implants were optimally positioned.*

Figure 18: *Transfer copings were seated for final impressions, which were used to make a master cast.*

Figure 19: *The laboratory utilized dental CAD software to design custom titanium abutments with margins that were level with or just below the gingival surface.*

Figure 20: *BruxZir Full-Strength Solid Zirconia crowns were milled and seated on the master cast to confirm accuracy.*

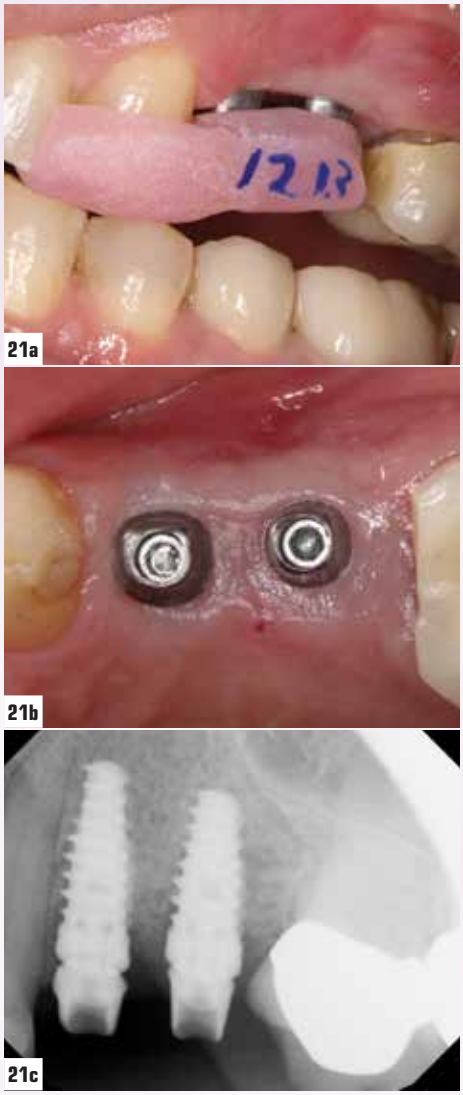
the healthy, grafted implant site *(Figs. 21a–21c)*. The BruxZir crowns were cemented over the custom abutments, and exhibited a natural, esthetic appearance *(Fig. 22)*.

CONCLUSION

The most important aspects of immediate implant placement and eventual final esthetic reconstruction can be summarized as follows:

1. Minimize extraction trauma, maintaining as much bone as possible.
2. Utilize minimally invasive surgical techniques; the tissue can typically be controlled with simple envelope flaps.
3. Initial stability is critical and can be maximized by selecting a tapered implant with an aggressive thread design.
4. When facial defects are present, proper grafting techniques can ensure optimal contours and ridge preservation for the implant restoration.
5. Custom abutments can be utilized to control the margins and esthetics of the final restoration.

With proper techniques, predictability can be achieved in dental implant integration, attached gingiva health and final prosthetic excellence. **IM**



Figures 21a–21c: *The Inclusive® Titanium Custom Abutments were delivered, and the lab-provided seating guide helped ensure proper positioning. The periapical radiograph confirmed complete seating.*

Figure 22: *The BruxZir crowns were cemented, demonstrating the final esthetic reconstruction of the maxillary left first and second bicuspids.*