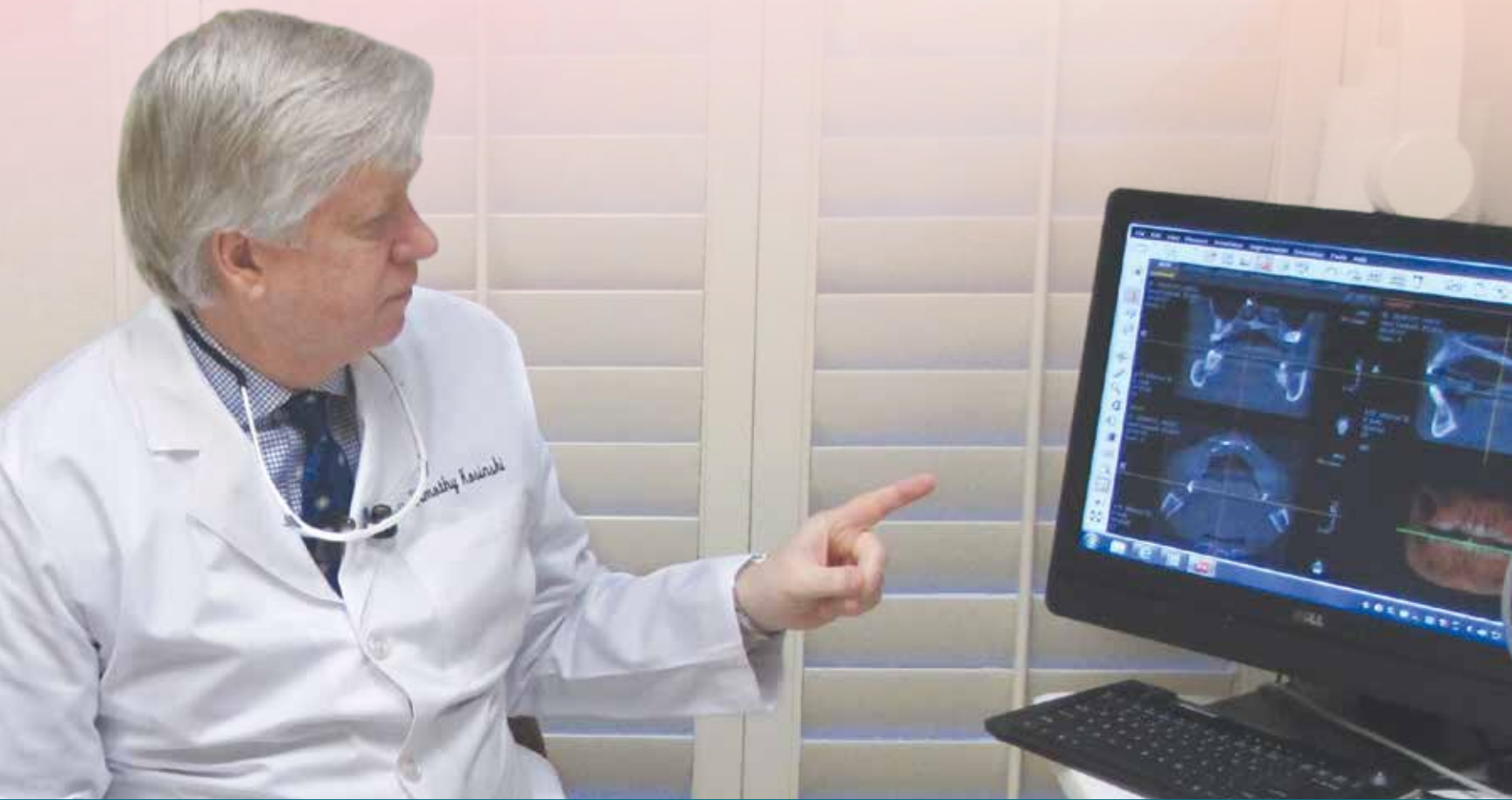


Bone Grafting and Immediate Implant Placement in the Anterior



by **Timothy F. Kosinski, DDS, MAGD**

Whether a consequence of periodontal disease, caries or trauma to the root, losing an anterior tooth is psychologically disturbing to patients.

When indicated, dental implants are an excellent option for tooth replacement. In many cases, an implant can be placed immediately after tooth extraction. When adequate primary stability is achieved, a provisional implant crown can be delivered on the day of surgery as well.

In the anterior, where esthetics are especially important, the emergence profile needs to be idealized in order to meet the patient's desires. With the latest dental CAD/CAM technology, custom temporary components can be made to replicate the contours and margins of the original tooth,

maintaining natural soft-tissue contours during the healing period.^{1,2} Due to advancements in dental materials, we also now have access to all-zirconia restorations that are both strong and esthetically pleasing.

The following case presentation illustrates effective tooth replacement in the smile zone. A Hahn™ Tapered Implant is immediately placed into an extraction site, leading to a predictable final restoration via a custom abutment and cement-retained implant crown. With the restorative-driven techniques described, it is possible to maintain bone levels, optimize soft-tissue contours and provide patients with a satisfying outcome.

CASE PRESENTATION

A 61-year-old male exhibited slight purulence around his maxillary right central incisor (Figs. 1a, 1b). The tooth, which was previously restored with a conventional porcelain-fused-to-metal crown, had become mobile. An endodontist had determined that the root was fractured horizontally and recommended extraction (Fig. 2). The patient had high blood pressure, which was controlled with medication, and no other significant medical findings.

Treatment options were discussed with the patient including a conventional 3-unit anterior bridge, a removable partial denture appliance, or a single dental implant reconstruction of the maxillary right central incisor. The patient elected to proceed with tooth extraction followed by dental implant restoration.

Physics Forceps® (Golden Dental Solutions; Roseville, Mich.) were used to remove the problematic tooth (Fig. 3). The “beak” of the instrument was placed onto the palatal aspect of the root, about 3 mm subgingivally. The “bumper,” or fulcrum, of the instrument was positioned as far up the vestibule as possible. With a simple rotation of the wrist toward the tip of the nose, the tooth was lifted up and out of the socket. The procedure was atraumatic, and no harm was done to the facial bone.

Due to the esthetic concerns involved with working in the anterior maxilla, an envelope flap was made, avoiding the creation of any vertical incisions. The envelope flap allowed visualization of the facial bone contours, evaluation of the interdental papillae, and observation of any dehiscence or defects in the facial bone (Fig. 4). The facial wall had a slight defect that could be easily repaired, and there was adequate bone apically to stabilize the implant. It was determined that the site would be prepared for immediate implant placement.

An osteotomy was created for a 4.3 mm x 11.5 mm Hahn Tapered Implant (Fig. 5). A 2 mm pilot drill was used to create the initial osteotomy about 3 mm palatal to the facial



Figures 1a, 1b: The patient presented with a failing, mobile maxillary right central incisor and had been experiencing discomfort in the area. Note the inflammation around the facial aspect of the existing porcelain-fused-to-metal crown.



Figure 2: Digital periapical radiograph indicates a horizontal fracture of the root of tooth #8 at the length of the post.



Figure 3: Physics Forceps were used to atraumatically elevate the non-restorable maxillary right central incisor, maintaining the facial plate of bone.

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Figure 4: Following extraction of the non-restorable tooth, a small facial defect was noted at the crest. An envelope flap was made, exposing the facial and palatal bone.

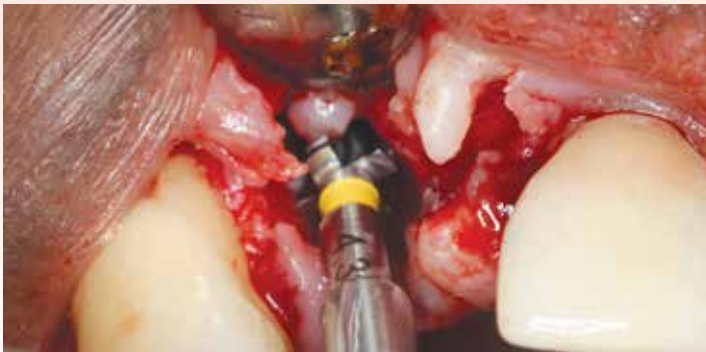


Figure 5: An osteotomy was prepared to receive a 4.3 mm x 11.5 mm Hahn Tapered Implant.



Figure 6: Cortico-cancellous bone grafting material was mixed with sterile saline to create a paste.



Figure 7: The allograft material was placed into the newly created osteotomy site.



Figure 8: To protect the graft from invagination of the epithelium, a resorbable synthetic membrane was passively positioned to engage at least 2 mm beyond the defect of the facial bone and 2 mm of palatal bone. Note that the membrane was well-maintained because it extended beyond the available bone and an envelope flap was created.

aspect of the adjacent crowns and about 3 mm deeper than the cemento-enamel junctions of the adjacent roots. To avoid the risk of perforating the relatively thin facial bone, the osteotomy was created without following the path of the extraction socket. A 4.3 mm x 11.5 mm surgical drill was used to create the final preparation, extending beyond the apex of the socket.

To maintain consistent bone volume, demineralized allograft material composed of cortico-cancellous particles was mixed with sterile saline to create a paste for grafting (Fig. 6). Allograft material has osteoconductive elements that promote new bone growth while maintaining adequate volume. The graft material was packed firmly, but not aggressively, into the socket site (Fig. 7). Because the graft has various-sized particles, which vary in their rates of resorption and bone replacement, the operator should avoid condensing the particles too firmly in order to prevent crushing the larger particles into smaller ones and elevating the rate of resorption.

A barrier membrane was placed to prevent ingrowth of the surrounding soft tissue and to permit osteogenic cells to repopulate the bone defects. The resorbable membrane was passively placed on the facial aspect of bone to act as a barrier (Fig. 8). When grafting a socket or attempting to repair a facial defect, it can be challenging to properly position the membrane and prevent it from dislodging prematurely. Because the membrane must be retained passively in order to promote predictable bone growth, it is important to elevate the attached gingiva and mucosa and make sure the barrier engages the facial bone at least 2 mm apical to any defect. This rule should also be followed on the palatal or lingual side. The gingiva can then be easily sutured, and the membrane will not dislodge.

The Hahn Tapered Implant was threaded into the osteotomy and then tightened to full seating with a torque wrench (Fig. 9). The prominent thread design of the implant allowed for precise, straightforward placement. Radiography confirmed proper positioning and full seating of the implant (Fig. 10). A flat cover screw was hand-tightened into the implant to minimize the pressure exerted on the implant during healing and osseointegration. The resorbable membrane was tucked over the crest of the ridge and engaged at least 2 mm of the palatal bone. The flap was closed with Vilet Plus™ sutures (Riverpoint Medical; Portland, Ore.), which demonstrate the high tensile strength that is critical throughout the healing period (Fig. 11). A maxillary flipper appliance was created to cover the palate, protecting the treatment site from excessive pressure (Fig. 12).

Postoperative CBCT scanning showed that the implant was positioned optimally (Fig. 13). Following seven days of healing, the sutures were removed (Fig. 14). The site was allowed to heal for approximately four additional months, and the patient returned for the final impression appointment (Figs. 15a, 15b).

A round tissue punch was used to access the implant site (Fig. 16). The tissue punch caused little trauma, allowing immediate final impressions to be taken using an open-tray transfer assembly. A final impression was made using vinyl polysiloxane material (Fig. 17). To prevent the tissue from healing over the implant while a temporary implant abutment and transitional crown were fabricated, a healing abutment was tightened into place (Fig. 18).

The lab fabricated a custom temporary abutment and provisional crown to help establish optimal tissue contours (Figs. 19a, 19b). Note that the margins of the abutment were level with the height of the gingiva. This prevented the possibility of cement being forced beneath the soft tissue. The patient was able to wear and evaluate the transitional crown for three weeks. The interdental contours improved over time.

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Figure 9: The 4.3 mm x 11.5 mm implant was threaded into the osteotomy.



Figure 10: A digital radiograph confirmed proper positioning of the implant.



Figure 11: The membrane was extended over the surgical site, and Vilet Plus sutures were used to close the flap.



Figure 12: A prefabricated single-tooth removable appliance was seated. Note that the goal was to maintain some semblance of interdentinal papilla, which needs to be supported by interseptal bone.

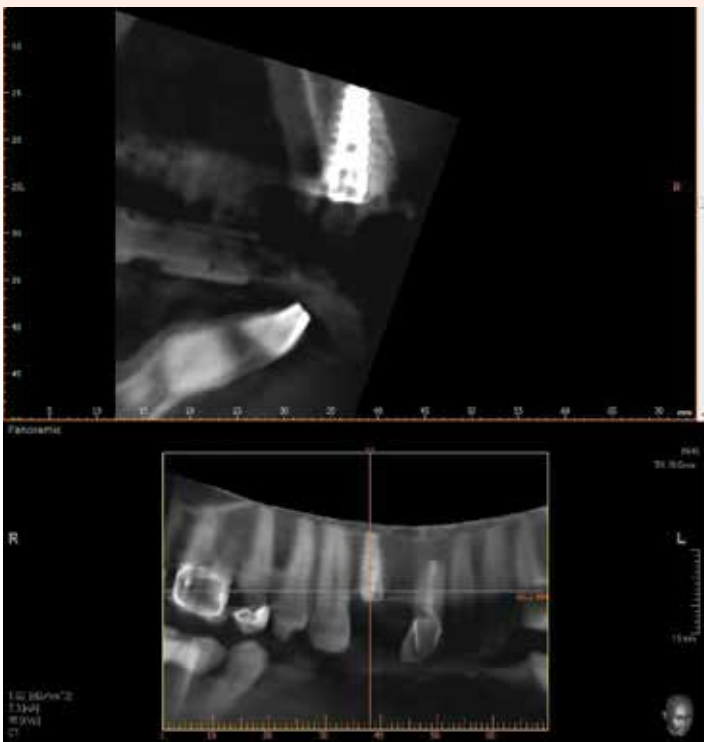


Figure 13: The postoperative CBCT scan illustrates the nicely positioned Hahn Tapered Implant.



Figure 14: One-week postoperative healing of the surgical site, prior to suture removal.



Figures 15a, 15b: Maintenance of the interdentinal papilla and nice healing of attached gingiva after four months of healing.



Figure 16: A tissue punch was used to carefully uncover the implant.

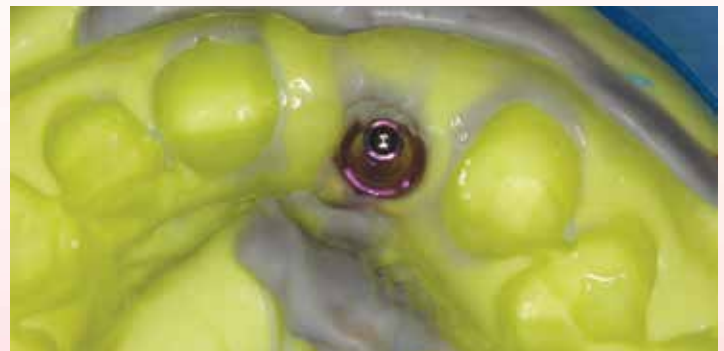


Figure 17: Vinyl polysiloxane material was used to create an accurate final impression.

Following patient approval of the provisional restoration, the lab fabricated an Inclusive® Zirconia Custom Abutment with titanium base and a BruxZir® Anterior crown (Fig. 20). Utilizing the latest dental CAD/CAM techniques, the custom abutment and crown were produced with precision. This allowed the final restorative components to be seated with minimal adjustment. The custom abutment was tightened to full seating using a torque wrench and provided a precise fit and substructure for the final all-zirconia crown (Fig. 21). Because BruxZir Anterior crowns exhibit translucency similar to natural dentition, the custom zirconia abutment helped maintain lifelike results (Fig. 22).

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Figure 18: A 5-mm-tall healing abutment was placed to guide the soft-tissue contours during healing and eliminate the need to punch the tissue again prior to seating the final restoration.



Figure 20: To maximize esthetics, a custom zirconia abutment with titanium base and a BruxZir Anterior crown were fabricated to complete the case.



19a



19b

Figures 19a, 19b: A titanium transitional abutment and temporary crown were delivered to help establish the final emergence profile, which is critical for optimal esthetics in the anterior.



Figure 21: The final custom abutment was delivered. Note the slightly subgingival final margin.

CONCLUSION

Excellent form and function can be achieved with prosthetically driven implant treatment. Modern implant techniques and design allow for outstanding initial stability and immediate implant placement when indicated. When properly executed, grafting techniques help maintain bone. In this demanding case in the smile zone, the Hahn Tapered Implant provided an excellent foundation for predictable tooth replacement. Provisionalization with the transitional abutment and crown also played a key role in providing the patient with an esthetic final restoration in a challenging area of the mouth. **IM**



Figure 22: The final BruxZir Anterior crown was cemented over the custom abutment.

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