Restorative Driven Implant Solutions Utilizing the Latest Technology

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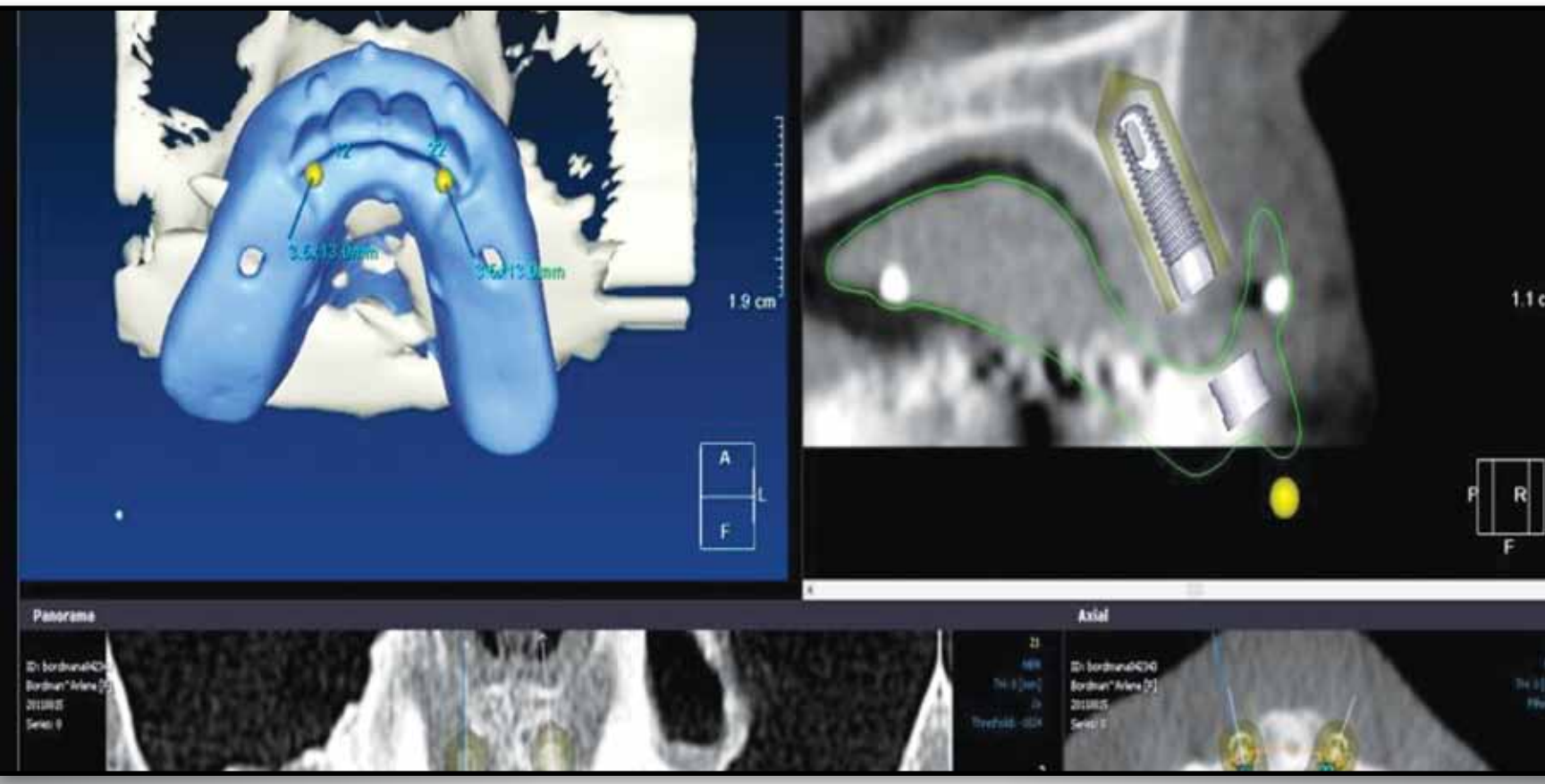


by *Timothy F. Kosinski, DDS, MAGD*

As a general dentist who has placed nearly 7,000 dental implants, I have come to understand the importance of planning from day one for the implant placement and soft tissue healing that will help me achieve my prosthetic goals for the patient. Being able to visualize the finished case prior to starting is even more relevant today, given patient expectations with regard to efficiency and outcome. Due to recent advancements in dental technology, this is easier than ever before.

With CBCT-aided diagnoses and treatment planning, for example, we are able to predictably and virtually place implants using the latest computer software. The use of surgical guides based on a virtual plan has made procedures predictable and less invasive for the patient.[1] Often, flapless surgical procedures can be used, which further minimizes healing time and patient discomfort.

Meanwhile, the next generation of CAD technology affords us the ability not only to determine implant positioning in bone, but also to determine soft tissue contours utilizing custom, patient-specific transitional appliances: custom-milled healing abutments for maximizing final tissue contours, custom-milled transitional or temporary abutments for supporting the transitional prosthetic appliance, and custom-milled impression copings that match the tissue contours created by the healing abutment or transitional abutment. The utilization of these appliances allows the tissue to heal properly in the best position possible, the patient and dentist to visualize the emergence profile of the transitional restoration, and the laboratory technician to ultimately understand tissue health, contour and ideal esthetics.

Despite such technological innovations, many general dentists still avoid placing implants, demonstrating a seeming lack of interest in providing what is a progressive, predictable treatment in an exciting field of dentistry. Some express a lack of confidence in the surgical applications and the fear of damaging a nerve or sinus. Others worry that they will not be able to anticipate all the costs involved in order to deliver their services profitably. Traditionally, implant dentists have had to maintain complicated inventories of drills, implants and related components. Laboratory fees and other costs have not always been predictable either. For these and other reasons, the adoption of implant treatment services by many general practitioners remains a daunting prospect.

However, the introduction of the Inclusive® Tooth Replacement Solution from Glidewell Laboratories represents a significant breakthrough. With all of the necessary components provided for a single, fixed price, concerns about cost control are eliminated from the outset. Moreover, users can routinely offer their patients implant solutions that are restorative-driven at every step of the treatment. Rather than wait until the implant has healed to learn whether an esthetic final restoration can be created, the dentist can feel confident in advance that it will be.

PLANNING PHASE

While the Inclusive Tooth Replacement Solution does not require use of a CT scan, a scan can provide accurate anatomical information that would be otherwise inaccessible, eliminating risks and simplifying the surgery. Virtually placing an implant prior to ever touching the patient is a logical treatment step. Most patients seem to understand this and are willing to invest in a CT diagnosis.

After the CT scan, the scan data and impressions are sent to Glidewell Laboratories, where the model is fabricated and optically scanned. The scan of the model and CT scan of the patient are imported into planning software. A Web-based teleconference is then conducted with the treating dentist to finalize the plan. The surgical guide and a 3-D model are printed. The custom healing abutment, custom temporary abutment, BioTemps® provisional crown (Glidewell Laboratories) and matching impression coping are designed and milled. All of these customized components, along with the desired implant and related drills, are delivered to the practice approximately one week later in a single box.

SURGICAL PHASE

For implant placement, the optimal implant positioning is directed through use of either a prosthetic guide, which is provided when stone models are used for diagnosis, or a surgical guide based on a CT scan. This guide not only helps to ensure a safe and predictable path of insertion, but also positions the implant and prosthetic platform in an optimal orientation for placement of the transitional (and later, final) restorative components.

Through placement of a custom-milled temporary abutment, sculpting of the soft tissue begins as soon as the implant is sufficiently stable, either at the time of surgery or after initial healing. In my experience, if an implant can be torqued into place in the initial osteotomy site to 35 Ncm or more, it can be predictably loaded with a transitional crown, as long as excursive contacts are removed and there is no excessive occlusal force placed.[2,3] CT planning ensures that implants and crowns are ideally situated, so that forces are maintained along the long axis of the implant. If the implant is torqued to less than 35 Ncm, the custom healing abutment at the level of the soft tissue can be used. With either component, soft tissue sculpting commences immediately post-surgery.

RESTORATIVE PHASE

Upon successful osseointegration and appropriate soft tissue healing, a final impression is made using a custom impression coping. Milled to replicate the gingival architecture created during the healing phase, the custom impression coping captures the exact soft tissue contours formed by the custom temporary abutment. This can be of tremendous assistance to

the laboratory in the creation of an ideal final prosthesis, as it provides a clearer image of the definitive emergence profile, which is critical to the esthetic outcome. A traditional stock impression coping does not accurately convey the soft tissue architecture around the margin, thus making the laboratory's job more difficult and the final restoration less predictable. While techniques exist for the fabrication of a custom impression coping chairside, clinicians seeking to maximize clinical efficiencies and reduce chairtime will appreciate the convenience of having this custom component prepackaged for initiation of the restorative phase.

CASE REPORTS

For the cases that follow, a CT scan was done with the patients' bite open at least 5 mm. You do not want the patient to be scanned in a fully occluded state, as this could create overlap and inaccuracies. The laboratory can provide various surgical guide options to help you with this important step. Here, a single surgical guide compatible with Universal SurgiGuide® Drill Keys (Materialise Dental Inc.; Glen Burnie, Md.) was used for each case. Keys based on the drill diameters to be used were placed in the sleeves of the surgical guide to direct each drill precisely. Based on the virtual plan and clinical determination that there was adequate attached gingiva, the cases were done following a flapless procedure.

CASE ONE:

Figure 1: *Edentulous anterior maxilla. The patient lost her maxillary central and lateral incisors following an accident.*

Figure 2: *The patient had worn an RPD appliance for more than eight months. As her quality of life was remarkably diminished, she requested a permanent, fixed restoration.*

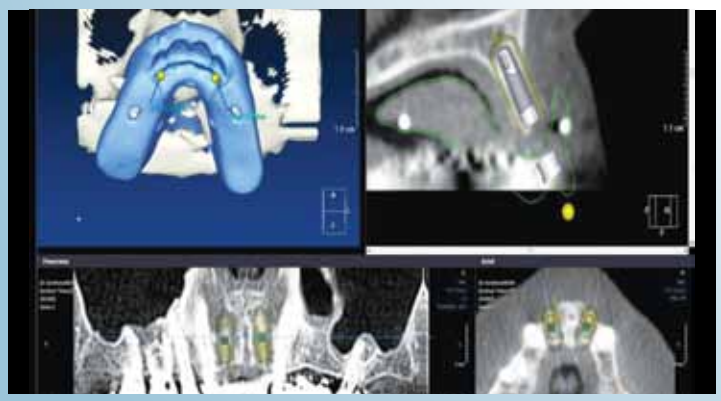


Figure 3: *A CT scan was done, and the implant placement virtually planned.*

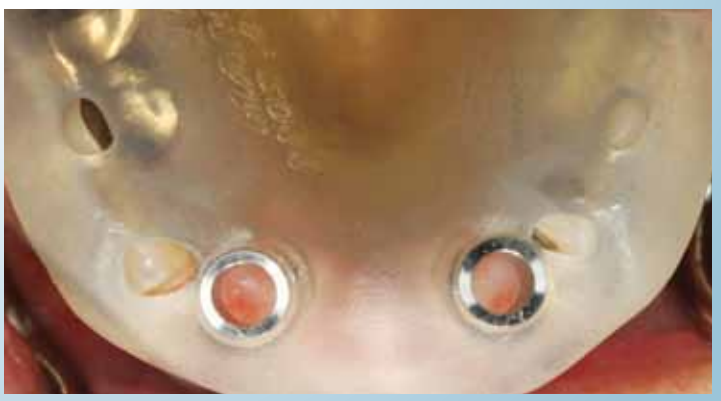


Figure 4: *A surgical guide was fabricated with sleeves to accommodate drill keys for each drill.*

Figure 5: *A 2.3 mm diameter key was inserted into the sleeve of the surgical guide, and the 2.3/2.0 mm pilot drill was used to create the initial osteotomy to the predetermined depth.*

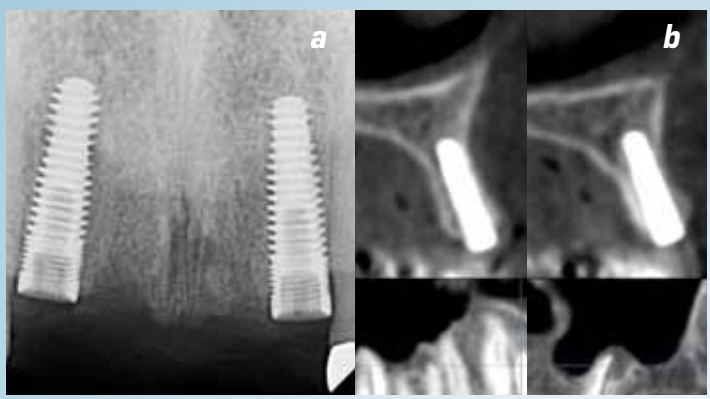
Figure 6: *A 2.8 mm diameter key was used for the 2.8/2.3 mm surgical drill.*

Figure 7: *Based on the patient's bone density, the 3.4/2.8 mm surgical drill was used to create the final width of the osteotomy to accept the 3.7 mm diameter Inclusive® Tapered Implant (Glidewell Laboratories). A 3.5 mm key was used in this case to provide proper guidance.*

Figure 8: *The surgical guide was removed from the mouth and the implant inserted.*

Figure 9: *The implant driver was utilized with the torque wrench for final seating of the implant. One flat on the internal hex of the implant should face the labial, matching the orientation of the implant analog in the model.*

Figure 10: *Immediate placement of the implants in the maxillary right and left lateral incisor areas showed little to no bleeding. The flapless procedure was relatively noninvasive.*



Figures 11a, 11b: *Digital radiograph of the implants ideally positioned per the CT planning software and final CT illustrating position of the implants, which mimics the pre-surgical virtual determination*

Figure 12: *The Inclusive Tooth Replacement Solution for this case includes: custom temporary abutments used if the implants are torqued to a minimum of 35 Ncm; a BioTemps bridge #7–10; custom healing abutments approximating ideal tissue contours; and custom impression copings to be used after integration and tissue healing. All are custom-fabricated to assist in developing the ideal soft tissue contours and emergence profiles.*

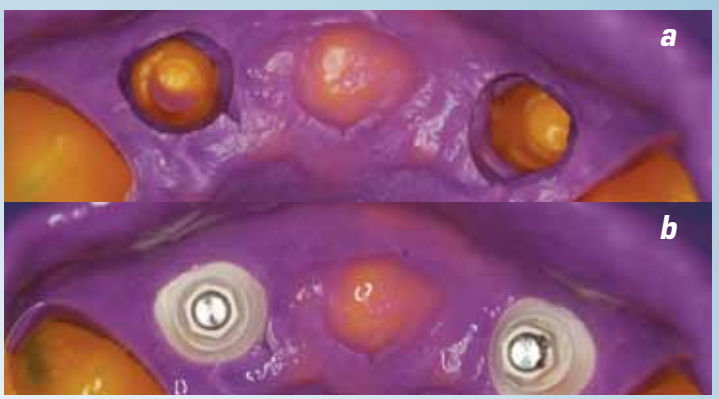
Figure 13: *Because the implants were torqued to over 35 Ncm, custom temporary abutments were positioned to accept the premade provisional bridge. Tissue contours were established immediately following surgical placement of the implants.*

Figure 14: *The transitional bridge was seated over the custom temporary abutments immediately at implant placement.*

Figure 15: *With the transitional bridge in place, the patient exhibited a Class II relationship with no anterior occlusion.*

Figure 16: *Occlusal view of the transitional bridge*

Figure 17: *The final impression was made using the custom impression copings. This enabled the laboratory to begin fabrication of the final zirconia abutments and bridge while the patient was healing. Note that the impression components capture the exact soft tissue contours formed by the custom temporary abutments, assisting the laboratory in creating an ideal final prosthesis.*



Figures 18a, 18b: *The impression was made and the impression copings snapped into the impression for the laboratory to fabricate the master cast.*

CASE TWO:

Figure 1: *Preoperative view of periodontally involved maxillary left central incisor*

Figure 2: *Digital radiograph of periodontally involved tooth #9*

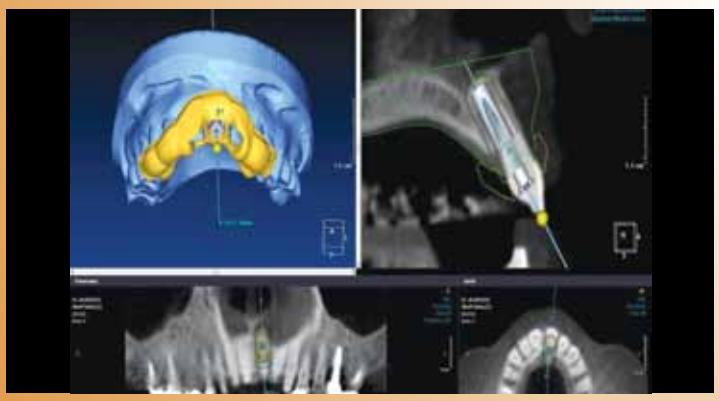


Figure 3: *CT-based virtual plan of maxillary left central incisor, indicating where the implant will be placed at the time of extraction*

Figure 4: *A computer-generated model was fabricated once virtual placement was completed.*

Figure 5: *A surgical guide was then created to position the implant correctly.*

Figure 6: *Using the Inclusive Tooth Replacement Solution, a custom temporary abutment and BioTemps provisional crown, custom healing abutment, and custom impression coping were fabricated.*

Figure 7: *Planning for the possibility of low insertion torque and the patient's desire for a provisional restoration at the time of surgery, a removable partial denture was also fabricated.*

Figure 8: *The tooth was atraumatically extracted using Physics® Forceps (Golden Dental Solutions Inc.; Detroit, Mich.).*

Figure 9: *The surgical guide was positioned over the osteotomy site.*

Figure 10: *A 2.4 mm diameter key was used to guide the 2.3/2.0 mm pilot drill.*

Figure 11: *A 3.9 mm diameter key was used to guide the 3.8/3.4 mm surgical drill.*

Figure 12: *The osteotomy was completed with the 4.4/3.8 mm surgical drill.*

Figure 13: *To maintain sterility, the 4.7 mm Inclusive Tapered Implant was carried to the osteotomy site using the attached carrier.*

Figure 14: *The implant was advanced using the attached carrier as a finger driver.*

Figure 15: *A torque wrench was used for final seating, positioning the implant with one of the internal hex flats to the facial, matching the orientation in the model as closely as possible. Final insertion torque did not exceed 35 Ncm.*

Figure 16: *Digital radiograph of implant positioned, approximating the cemento-enamel junction (CEJ) of the adjacent roots*

Figure 17: *Due to the lower-than-requisite final torque value, the decision was made to place the custom healing abutment and seat the RPD appliance, rather than load the implant with the custom temporary abutment and provisional crown.*

Figure 18: *With the RPD appliance in place, integration was allowed to progress predictably, with minimal stress on the implant site.*

DISCUSSION

Success with implant dentistry is based on the need to achieve primary stabilization and secondary integration of the implant, while maintaining hard and soft tissue contours to create long-term function and esthetics.[4,5] Just as CT scanning software is changing the way we practice implant surgery, CAD/CAM technology is changing the restorative aspects of our practices. These improved, patient-specific materials and techniques are fast becoming preferential to conventional components. Precise, biocompatible materials with great mechanical strength and esthetics are constantly improving the fabrication of our prostheses, making them more predictable.

A striking feature of the Inclusive Tooth Replacement Solution is that it allows for substantial treatment versatility, enabling excellent soft tissue contouring regardless of the choices made. If the dentist finds it impossible to torque an implant to at least 35 Ncm, the included custom healing abutment can be utilized and the soft tissue around the implant trained to an ideal contour.

After osseointegration has been achieved, the custom healing abutment can be replaced with the custom temporary abutment, which duplicates the tissue contours of the healing abutment. Because the contours of the temporary abutment mimic those of the patient's original tooth root, the soft tissue healing that occurs around it sets the stage for an optimal emergence profile when the final abutment and restoration are delivered. Alternately, if a torque of greater than 35 Ncm is achieved when the implant is placed, the custom temporary abutment and BioTemps crown can be placed immediately.[6]

SUMMARY

Within just the past few years, advances in diagnostic technology and surgical protocols have made dental implant treatment substantially simpler, safer and faster. The introduction of the Inclusive Tooth Replacement Solution takes that simplification even further, as it eliminates the biggest barriers to placing implants and provides all the tools necessary to work from the very onset of treatment toward achieving the most esthetic restoration possible. As dentists, don't we have an obligation to provide our patients with the most innovative, proven techniques available? **IM**

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