



# Immediate Implant Prosthesis Via Guided Bone Reduction



Swati Ahuja,  
BDS, MDS

Nicholas  
Egbert, DDS,  
MDS

Russell Wicks,  
DMD, MS

Robert  
Brandt, DDS,  
MS

## INTRODUCTION

The conventional Brånemark approach of restoring implants 4 to 6 months after placement achieves excellent results.<sup>1-7</sup> However, this approach requires increased treatment time for the patient and may result in dissatisfaction, as he or she may not wish to be transitioned with removable restorations or be without teeth for extended periods of time.<sup>8-10</sup> High success rates of one-stage treatment and immediately loaded mandibular fixed interforaminal implant restorations are supported by the literature.<sup>1,9,11-17</sup> For a patient with a hopeless dentition desiring prosthesis on the day of the surgery, the treatment sequence includes the following: (1) extraction of the remaining teeth, (2) performing bone reduction or alveoloplasty (as needed), (3) placement of implants in the “general” vicinity of the fabricated immediate denture, and (4) converting the immediate denture into a fixed prosthesis.<sup>18,19</sup> With this protocol, the restorative dentist has been often encumbered by an “osseous-driven” implant placement approach and has struggled to predictably and efficiently engage implant components during immediate provisionalization procedures. Discrepancies between the path of insertion and the implant trajectory results in significant acrylic and tooth reduction around the anticipated implant locations of the provisional restoration. Such discrepancies compromise prosthesis strength and aesthetics.<sup>20</sup> Also, the entire process is laborious and time consuming for both the patient and practitioner and at times, yields less than ideal results.

### Digital Treatment Planning for Implants

Since last decade, implant placement and immediate provisionalization techniques have undergone major changes.<sup>21-23</sup> This has been due to the advancements and accessibility to better imaging and computer technology.<sup>24,25</sup> For any implant restoration to be successful, it is critical to plan and place implants accurately.<sup>3,19</sup>

The restorative dentist should decide the type and the design of the definitive prosthesis before implant placement and plan the implants based on the design of

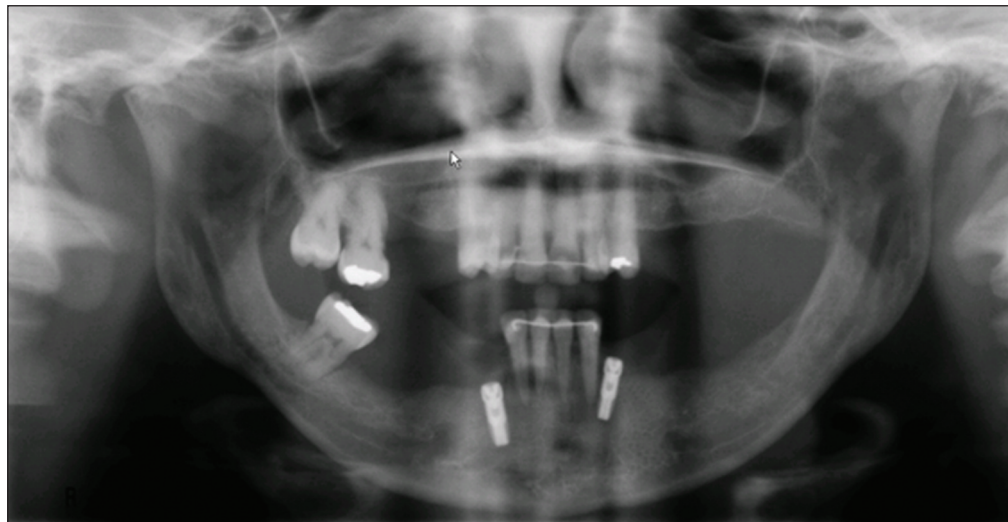


Figure 1. Preoperative panoramic radiograph of the patient.

*For any implant restoration to be successful, it is critical to plan and place implants accurately.*

the final prosthesis. This can be most predictably achieved through 3-D-guided planning and 3-D-guided implant surgery.<sup>20-22</sup> Combining the CAD and CAM techniques, digital implant planning can be applied to clinical practice using 3-D surgical guides. These techniques help with visualization of bone and the prosthesis at the same time.<sup>26</sup> This has helped change the osseous-driven approach to a combination osseous- and prosthetic-driven approach for implant placement.<sup>26</sup> This digital implant planning can also be sent to the laboratory for pre-fabrication of fixed restorations. Since implants are placed in a near to ideal position, the surgery and provisionalization is done predictably and in a relatively short time.<sup>27,28</sup>

Nobel Biocare and Simplant (Materialise Dental) have been 2 of the largest contributors to this treatment modality. While the NobelGuide Surgical Template (Nobel Biocare) guides the 3-D placement of implants and the fabrication of accurate retro-engineered casts for the fabrication of immediate provisional restorations, it does not support the design and fabrication of bone reduction guides. Most of the studies discussing 3-D-guided surgeries for the

rehabilitation of the mandible on the same day with implant-supported fixed restorations describe procedures done on edentulous ridges with acceptable contours,<sup>29-34</sup> since any modification of the ridge could affect the seating of the surgical template, placement of the implants, and the fit of the restoration. This article describes a novel approach of integrating a guided bone reduction system (Simplant) to the Nobel 3-D-guided surgery protocol (NobelGuide Surgical Template) for implant placement and provisionalization. Many patients with nonrestorable teeth may benefit from immediate extraction, bone reduction, immediate placement, and immediate loading of implants. In addition, combining these modalities can improve management of the restorative space both surgically and prosthetically.<sup>35,36</sup>

This article outlines a case report in which a bone reduction guide was integrated in the 3-D implant-planning software (NobelClinician [Nobel Biocare]) to accomplish 3-D-guided alveoloplasty and 3-D-guided implant surgery to transition a patient with nonrestorable mandibular teeth to a transitional hybrid restoration on the same day.

## CASE REPORT

### Diagnosis and Treatment Planning

A 56-year-old female presented to the Prosthodontic Graduate Residency Clinic at the University of Tennessee Health Science Center in Memphis with the complaint that she could not chew her food. She had no significant medical history. The patient knew that her mandibular teeth were nonrestorable; however, she had delayed treatment because she did not want to wear a complete denture at any time. The patient had many missing teeth (teeth Nos. 3, 4, 6, 11, 13 to 16, 17 to 22, 27 to 30, and 32), all lost approximately 7 to 9 years previously due to caries and periodontal disease (Figure 1).

Upon examination, probing depths of the remaining maxillary teeth were between 2.0 to 3.0 mm in all areas. Probing depths of the mandibular teeth were between 5.0 to 7.0 mm. The mandibular teeth were affected by generalized chronic periodontitis. There was extreme vertical and horizontal bone atrophy of the posterior mandible in the region of the molar teeth (Figure 2). Teeth Nos. 5 and 12 had been previously repositioned with orthodontic treatment into the cuspid position. Teeth Nos. 1 and 2, and the remaining mandibular teeth, all had a poor prognosis. Two implants placed in the position of teeth Nos. 22 and 27 were not restorable due to their extreme angle of divergence. An implant, previously placed in the position of No. 22, was in direct contact with tooth No. 23, causing pain during mastication. Removal of these 2 implants was recommended to the patient.

Diagnostic impressions were made and diagnostic casts were mounted on a semiadjustable articulator (Whip Mix 2240 [Whip Mix]) to evaluate the occlusion, occlusal plane, as well as the available restorative and aesthetic space. A diagnostic 3-D CBCT scan was taken to verify the clinical findings and to plan treatment. The scan demonstrated that the mandibular ridge, from teeth Nos. 21 to 28, had optimal quality and quantity of bone; however, it was knife-edged. So, alveoplasty was indicated to optimize the contours of the mandibular ridge.

After a thorough diagnostic work-up, the patient was treatment planned as follows:

#### For the Mandible:

- Removal of the 2 implants
- Extraction of the remaining mandibular teeth
- 3-D-guided alveoplasty in the region of teeth Nos. 21 to 28
- 3-D-guided implant surgery
- Immediate provisionalization with an implant-supported fixed restoration (hybrid)
- Delivery of the definitive prosthesis after healing of implants.

#### For the Maxilla:

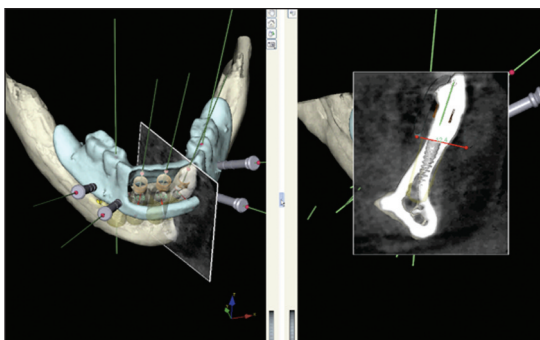
- Extraction of teeth Nos. 1 and 2
- 3-D-guided implant surgery
- Rehabilitation with implant-supported



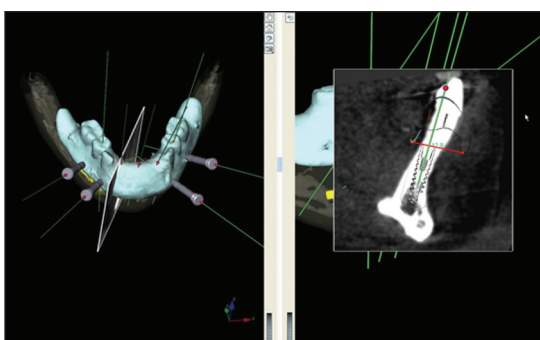
**Figure 2.** Severe resorption of the mandibular ridge noted in the region of the molar teeth.



**Figure 3.** Radiographic template No. 1 with an anterior labial window. The inferior border of the window of the template denotes the proposed post-surgical bone level.



**Figure 4.** Scan with template No. 1. (Left) 3-D planning with 5 implants and 4 anchor pins. (Right) Cross-sectional view of implant in the position of tooth No. 22. The red line defines the height of the proposed bone reduction.



**Figure 5.** Scan with template No. 2 with anterior acrylic to support the sleeves. (Left) 3-D planning imported from the previous scan (5 implants and 4 anchor pins). (Right) Cross-sectional view of implant in the position of tooth No. 26. The red line defines the height of the proposed bone reduction.

fixed partial dentures bilaterally after healing of the implants.

### Treatment Protocol for the Mandible

The patient was scheduled for removal of the 2 mandibular implants and they were removed as atraumatically as possible.<sup>37,38</sup> The site was grafted and augmented with Puros (Zimmer Dental) allo-graft, and a barrier membrane (CopiOs [Zimmer Dental]) was draped over the bone graft prior to closure. The site was then allowed to heal for 2 months.

The next step was to extract the teeth, reduce the mandibular anterior bone in a controlled and accurate fashion using a surgical guide, and then to place the implants following the 3-D-guided surgery protocol (NobelGuide) and secure a provisional implant-supported fixed restoration at the same appointment.<sup>29-31</sup> The procedure for the same is described as follows.

### Phase I: Fabrication of Radiographic Template No. 1

The original protocol for planning a 3-D-guided surgery (NobelGuide; NobelClinician) requires 2 scans.<sup>29,30,32,33</sup> The first scan is taken of the patient wearing the radiographic template, and the second scan is taken of the radiographic template by itself. The scan of the radiographic template automatically translates the fit of the radiographic template to the fit of the surgical template. The 2 scans permit digitization of the patient's anatomy and the radiographic guide (template). The raw data obtained from the scans is then converted to Digital Imaging and Communications in Medicine (DICOM) data using the NobelClinician 3-D implant-planning software. The DICOM files are imported to the treatment planning NobelClinician software that allows for implants to be virtually placed in the bone. (Note: In order to be able to import files in the 3-D implant-planning software, they must be converted into DICOM format.) Both the bone and the prosthesis are taken into consideration when planning the implant position, since the 3-D implant-planning software permits visualization of the bone and the prosthesis individually and together. This allows collaboration among the restorative dentist, the surgeon, and the dental laboratory team to ensure ideal implant placement with consideration of the anatomic structures, aesthetics, and the design of the prosthesis.

The radiographic template was constructed as follows: Primary maxillary and mandibular impressions were made and diagnostic casts were fabricated for the patient. Record bases and wax rims were fabricated on diagnostic casts. Jaw relation records were taken. The mandibular cast was blocked and duplicated. The maxillary and mandibular casts were then mounted on the articulator (2240 Q articulator [Whip Mix]). Denture teeth (SR orthotype DCL [Ivoclar Vivadent]) were set in the wax rims to replace the missing teeth (to define the position of the



prosthetic teeth in the definitive restoration). The wax trial denture was tried in the patient's mouth. The occlusion was verified, and the wax-up was transferred to the duplicate cast.

The mandibular wax trial denture along with the duplicate cast was sent to the laboratory team for fabrication of radiographic template according to the Nobel 3-D-guided surgery protocol.<sup>32</sup> This radiographic template, designated as "Radiographic Template No. 1," had 6 fiducial markers (gutta-percha markers)—4 buccal and 2 lingual (Figure 3).<sup>32</sup> These markers are used by the NobelClinician software to align the patient scan with the scan of the radiographic template.<sup>32</sup> Radiographic Template No. 1 was constructed with a window around the existing natural teeth. The exact amount of bone to be removed from the mandibular ridge was calculated utilizing the diagnostic CBCT scan. Accordingly, the inferior border of the window of the template was constructed such that it could be used as a reference point to denote the proposed post-surgical bone level (Figure 3).

#### Phase II: CBCT Scan and Planning of Implants

A CBCT scan (CBCT CS 9300 [Carestream Dental]) was made of the patient with the Radiographic Template No. 1 completely seated in the mouth. (The field of view was medium, slice thickness: 0.5 mm.)

As seen in the previous scan, the mandibular anterior ridge was knife-edged, but it had optimal quality and quantity of bone. Three 3.5 x 10 implants were virtually planned in the region of teeth Nos. 23, 24, and 26. Two 3.5 x 11.5 implants were planned in the Nos. 28 and 21 regions of the mandible (Figure 4). Four anchor pins (used routinely with NobelGuide) were planned to stabilize the surgical guide during implant surgery (Figure 4). Anchor pins help fixate the surgical guide to the ridge and prevent its movement during implant placement. Care was taken to avoid placement of the anchor pins in the area of the bone reduction to not lose the location of the pins after osteotomy. This is because they serve as reference points and also help with stabilization of the surgical template. Once the plan was approved, it was saved for future use.

The 3-D-guided surgery protocol guides the implant placement in x, y, and z axes. The implants were placed through the sleeves present in the surgical guide. The NobelClinician



Figure 6. Surgical Guide No. 2.



Figure 7. Surgical Guide No. 1 and the interocclusal record that was made with template in the mouth to mount the retro-engineered cast.

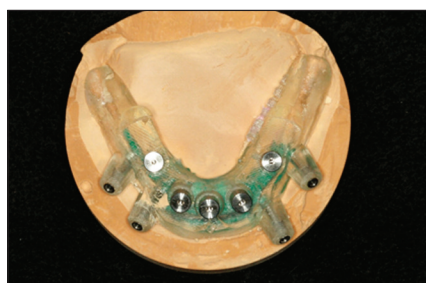


Figure 8. Retro-engineered cast.

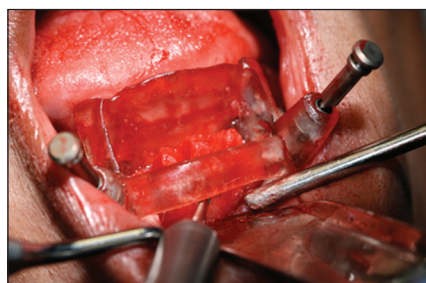


Figure 9. Alveoplasty was performed with the inferior border of the guide as the reference. The anchor pins maintained the position of the guide during surgery.

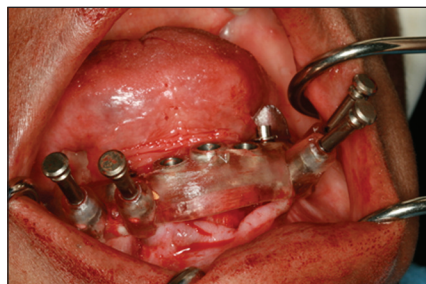


Figure 10. Surgical Guide No. 2, in place after the alveoplasty.

implant-planning software requires template material (acrylic) to integrate the implant guide sleeves in the surgical template. Since there was a window in Radiographic Template No. 1, sleeves could not be integrated in it; hence, it had to be modified. To accomplish it, a controlled modifica-

tion (removal of all the remaining mandibular anterior teeth) was performed on the diagnostic cast. Then, Radiographic Template No. 1 was placed on the modified cast and self-curing acrylic (Lang Dental) was added to it to bridge the gap between the buccal and the lingual anterior aspect of the template. This modified template was then designated as "Radiographic Template No. 2."

Since Radiographic Template No. 2 was a modified version of the original template, it maintained the original fiducial marker positions. Another scan was made of Radiographic Template No. 2 by itself, raw data was converted to DICOM data, and the DICOM files were imported into the software.

Anchor pins and implants were imported from the first plan to the new DICOM files (Figure 5). A total of 5 implants were planned to fabricate an implant-supported fixed restoration for the patient (Figure 5).

Next, the planning with both Radiographic Templates Nos. 1 and 2 was approved, and then the CAD files were sent to the production facility (NobelProcera [Nobel Biocare]) for the fabrication of 2 surgical guides. In the production facility, the stereolithic guides were constructed based on the information provided by the CAD files. The CAD files would also be used to construct the stereolithic denture that would then be used by the dental laboratory team to construct the provisional prosthesis. The first surgical guide, designated as "Surgical Guide No. 1," was fabricated from the scan (and CAD files) of Radiographic Template No. 1 and would be used to reduce the bone and

place the posterior implants. The second surgical guide (Figure 6), designated as "Surgical Guide No. 2," was fabricated from the scan (and CAD files) of Radiographic Template No. 2 and would be used to place the anterior implants and retro-engineer a cast from it.<sup>33,34,39</sup>

#### Phase III: Fabrication of the Provisional Restoration

Surgical Guide No. 1 was tried in the patient's mouth and adjusted as necessary to ensure an acceptable fit. Then a vinyl polysiloxane (Regisil [DENTSPLY Caulk]) interocclusal record was made with the Surgical Guide No. 1 in place (Figure 7).

Surgical Guide No. 2 was used to fabricate a retro-engineered implant level cast following the manufacturer's protocol (Figure 8).<sup>33,34,39</sup> The interocclusal record made with Surgical Guide No. 1 was used to mount the retro-engineered cast with the Surgical Guide No. 2 seated on it, against the maxillary diagnostic cast.

Temporary abutments were fixated to the implant analogs and the provisional implant-supported fixed restoration was fabricated for the patient.<sup>39-41</sup> The provisional was fabricated with plastic temporary cylinders in all but No. 28 (titanium cylinder), since it was theoretically the most predictable surgical implant position. The plastic temporary cylinders were then removed with drills from the intaglio surface; they would be picked up at the chair on the day of the surgery.

#### Phase IV: Extraction, Alveoplasty, 3-D-Guided Implant Surgery, and Delivery of the Provisional Prosthesis

Local anesthetic was administered to the patient, and then Surgical Guide No. 1 was placed in the mouth. Osteotomies were made for the anchor pins using the pilot drills. Then, anchor pins were screwed through the guide to the bone. Two posterior implants (Nos. 21 and 28) were placed through the Surgical Guide No. 1, following the guided-surgery protocol (NobelGuide).

The mandibular anterior teeth were extracted atraumatically and the mandibular ridge was reduced to the predetermined level (Figure 9). Surgical Guide No. 1 was removed following the removal of implant mounts and anchor pins. Then, Surgical Guide No. 2 was placed in the mouth (Figure 10) and was checked for fit and stability. Next, anchor pins were screwed into the bone as discussed previously.

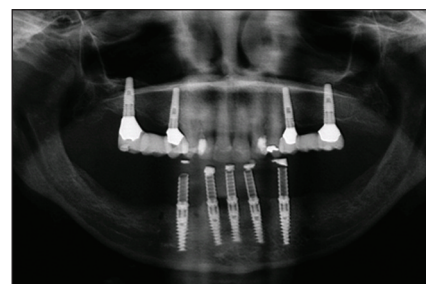


Figure 11. Panoramic radiograph depicting the maxillary and mandibular implants.



Figure 12. Provisional restoration delivered to the patient on the same day.



## Patient satisfaction increased as did the fit, aesthetics, cleansability, and strength of the prosthesis.

The remaining 3 implants were placed using Surgical Guide No. 2, following the NobelGuide protocol. During the surgery, when the osteotomies were created and the quality and quantity of bone was verified and found to be optimal, a radiograph was taken to assess the positions of the implants in the patient's mouth (Figure 11). Bone graft (Puros allograft) was used to graft the voids around the implants, then a barrier membrane (CopiOs) was then draped over the bone graft prior to closure.

Titanium temporary abutments were fixed to the implants in all the locations except No. 28. Provisional restoration was lined with acrylic on the intaglio surface and the abutments were picked up chairside. The provisional and the abutments were adjusted as necessary, the occlusion was adjusted and verified as needed and the restoration was finished and polished. The provisional restoration was connected to the implants with the attachment screws. The screw access holes were firmly closed with cotton pellets and light cured composite resin (Filtek P60 [3M ESPE]).

The patient was very pleased with the transitional restoration (Figure 12). She was asked to return the next day for recall and was given postoperative home care instructions eat only soft foods and to avoid putting excessive pressure on the prosthesis for 8 to 12 weeks. She was asked to come back after 4 months for the fabrication of the definitive restoration.

### Implant Surgery and Restoration of the Maxilla

Simultaneously, the patient was scheduled for extraction of teeth Nos. 1 and 2 and site preservation. Four implants [NobelActive [Nobel Biocare]] (Figure 11) were placed in the region of Nos. 3, 5, 12, and 14 to replace the missing teeth. These were then restored following the traditional 2-stage protocol with implant-supported fixed partial dentures bilaterally.

### CLOSING COMMENTS

The treatment plan and the technique discussed in this article ensured predictable bone removal and placement of implants, allowing the patient to receive the mandibular provisional prosthesis on the same day the osseous surgery (alveoloplas-

ty) and osteotomies were performed. As a result, the delivery of the prosthesis was more efficient and predictable. Also, patient satisfaction increased as did the fit, aesthetics, cleansability, and strength of the prosthesis. ♦

### Acknowledgment

The authors acknowledge Dr. Nicholas Egbert for providing the surgical and restorative support.

### References

- Brånemark PI, Hansson BO, Adell R, et al. Osseointegrated implants in the treatment of the edentulous jaw. Experience from a 10-year period. *Scand J Plast Reconstr Surg Suppl.* 1977;16:1-132.
- Brånemark PI, Adell R, Breine U, et al. Intraosseous anchorage of dental prostheses. I. Experimental studies. *Scand J Plast Reconstr Surg.* 1969;3:81-100.
- Albrektsson T, Dahl E, Enbom L, et al. Osseointegrated oral implants. A Swedish multicenter study of 8139 consecutively inserted Nobelpharma implants. *J Periodontol.* 1988;59:287-296.
- Ekelund JA, Lindquist LW, Carlsson GE, et al. Implant treatment in the edentulous mandible: a prospective study on Brånemark system implants over more than 20 years. *Int J Prosthodont.* 2003;16:602-608.
- Jemt T, Johansson J. Implant treatment in the edentulous maxillae: a 15-year follow-up study on 76 consecutive patients provided with fixed prostheses. *Clin Implant Dent Relat Res.* 2006;8:61-69.
- Lekholm U, Gunne J, Henry P, et al. Survival of the Brånemark implant in partially edentulous jaws: a 10-year prospective multicenter study. *Int J Oral Maxillofac Implants.* 1999;14:639-645.
- Pjetursson BE, Tan K, Lang NP, et al. A systematic review of the survival and complication rates of fixed partial dentures (FPDs) after an observation period of at least 5 years. *Clin Oral Implants Res.* 2004;15:625-642.
- Balshi SJ, Balshi TJ. Treating the trophic maxilla with an immediate implant supported fixed prosthesis. *Journal of Cosmetic Dentistry.* 2012;28:127-137.
- Strub JR, Jurdzik BA, Tuna T. Prognosis of immediately loaded implants and their restorations: a systematic literature review. *J Oral Rehabil.* 2012;39:704-717.
- Nkenke E, Fenner M. Indications for immediate loading of implants and implant success. *Clin Oral Implants Res.* 2006;17:19-34.
- Alfadda SA. A randomized controlled clinical trial of edentulous patients treated with immediately loaded implant-supported mandibular fixed prostheses. *Clin Implant Dent Relat Res.* 2014;16:806-816.
- Babbush CA, Kent JN, Misiak DJ. Titanium plasma-sprayed (TPS) screw implants for the reconstruction of the edentulous mandible. *J Oral Maxillofac Surg.* 1986;44:274-282.
- Calstellon P, Blatz MB, Block MS, et al. Immediate loading of dental implants in the edentulous mandible. *J Am Dent Assoc.* 2004;135:1543-1549.
- Goiato MC, Pellizzer EP, dos Santos DM, et al. Clinical viability of immediate loading of dental implants: part I—factors for success. *J Craniofac Surg.* 2009;20:2139-2142.
- Attard NJ, Zarb GA. Immediate and early implant loading protocols: a literature review of clinical studies. *J Prosthet Dent.* 2005;94:242-258.
- Schnittman PA, Wöhrlé PS, Rubenstein JE, et al. Ten-year results for Brånemark implants immediately loaded with fixed prostheses at implant placement. *Int J Oral Maxillofac Implants.* 1997;12:495-503.
- Schulte W, Heimke G. The Tübingen immediate implant [in German]. *Quintessenz.* 1976;27:17-23.
- Alsabeeha N, Atieh M, Payne AG. Loading protocols for mandibular implant overdentures: a systematic review with meta-analysis. *Clin Implant Dent Relat Res.* 2010;12(suppl 1):e28-e38.
- Esposito M, Grusovin MG, Maghaireh H, et al. Interventions for replacing missing teeth: different times for loading dental implants. *Cochrane Database Syst Rev.* 2013;3:CD003878.
- El Askary AES. Diagnostic considerations for esthetic implant therap. In: El Askary AES. *Fundamentals of Esthetic Implant Dentistry.* Oxford, England: Blackwell Munksgaard; 2007:13-78.
- D'haese J, Van De Velde T, Komiya A, et al. Accuracy and complications using computer-designed stereolithographic surgical guides for oral rehabilitation by means of dental implants: a review of the literature. *Clin Implant Dent Relat Res.* 2012;14:321-335.
- Jung RE, Pjetursson BE, Glauser R, et al. A systematic review of the 5-year survival and complication rates of implant-supported single crowns. *Clin Oral Implants Res.* 2008;19:119-130.
- Schneider D, Marquardt P, Zwahlen M, et al. A systematic review on the accuracy and the clinical outcome of computer-guided template-based implant dentistry. *Clin Oral Implants Res.* 2009;20(suppl 4):73-86.
- Danforth RA, Dus I, Mah J. 3-D volume imaging for dentistry: a new dimension. *J Calif Dent Assoc.* 2003;31:817-823.
- Arai Y, Tammisalo E, Iwai K, et al. Development of a compact computed tomographic apparatus for dental use. *Dentomaxillofac Radiol.* 1999;28:245-248.
- Hultin M, Svensson K, Trulsson M. Clinical advantages of computer-guided implant placement: a systematic review. *Clin Oral Implants Res.* 2012;23(suppl 6):124-135.
- Hämmerle CH, Stone P, Jung RE, et al. Consensus statements and recommended clinical procedures regarding computer-assisted implant dentistry. *Int J Oral Maxillofac Implants.* 2009;24(suppl):126-131.
- Sanz M, Naert I; Working Group 2. Biomechanics/risk management (Working Group 2). *Clin Oral Implants Res.* 2009;20(suppl 4):107-111.
- Balshi SF, Wolfinger GJ, Balshi TJ. Surgical planning and prosthesis construction using computed tomography, CAD/CAM technology, and the Internet for immediate loading of dental implants. *J Esthet Restor Dent.* 2006;18:312-325.
- Balshi TJ, Wolfinger GJ. Teeth in a day for the maxilla and mandible: case report. *Clin Implant Dent Relat Res.* 2003;5:11-16.
- Balshi SF, Wolfinger GJ, Balshi TJ. A prospective study of immediate functional loading, following the Teeth in a Day protocol: a case series of 55 consecutive edentulous maxillas. *Clin Implant Dent Relat Res.* 2005;7:24-31.
- Nobel Guide—Digital Precision for All Indications: Complete Treatment Concept for Diagnostics, Prosthetic-Driven Treatment Planning, and Guided Implant Surgery. nobelbiocare.com/us/en/home/products-and-solutions/treatment-concepts/guided-surgery.html. Accessed on April 8, 2015.
- van Steenberghe D, Naert I, Andersson M, et al. A custom template and definitive prosthesis allowing immediate implant loading in the maxilla: a clinical report. *Int J Oral Maxillofac Implants.* 2002;17:663-670.
- Sanna AM, Molly L, van Steenberghe D. Immediately loaded CAD-CAM manufactured fixed complete dentures using flapless implant placement procedures: a cohort study of consecutive patients. *J Prosthet Dent.* 2007;97:331-339.
- Ahuja S, Cagna DR. Defining available restorative space for implant overdentures. *J Prosthet Dent.* 2010;104:133-136.
- Ahuja S, Cagna DR. Classification and management of restorative space in edentulous implant overdenture patients. *J Prosthet Dent.* 2011;105:332-337.
- Froum S, Yamanaka T, Cho SC, et al. Techniques to remove a failed integrated implant. *Compend Contin Educ Dent.* 2011;32:22-30.
- Marini E, Cisterna V, Messina AM. The removal of a malpositioned implant in the anterior mandible using piezosurgery. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2013;115:e1-e5.
- van Steenberghe D, Glauser R, Blombäck U, et al. A computed tomographic scan-derived customized surgical template and fixed prosthesis for flapless surgery and immediate loading of implants in fully edentulous maxillae: a prospective multicenter study. *Clin Implant Dent Relat Res.* 2005;7(suppl 1):S111-S120.
- Balshi TJ. The Biotes conversion prosthesis: a provisional fixed prosthesis supported by osseointegrated titanium fixtures for restoration of the edentulous jaw. *Quintessence Int.* 1985;16:667-677.

41. Balshi TJ, Wolfinger GJ. Conversion prosthesis: a transitional fixed implant-supported prosthesis for an edentulous arch—a technical note. *Int J Oral Maxillofac Implants.* 1996;11:106-111.

**Dr. Ahuja** is an adjunct assistant professor in the department of prosthodontics at the University of Tennessee Health Science Center, Memphis. She is a prosthodontic consultant for Lutheran Medical Center, NY, and lectures internationally on implant overdentures, hybrid restorations, restorative space issues in implant overdentures, and the implementation of CBCT in the dental practice. She can be reached at sahuja@uthsc.edu.

Disclosure: Dr. Ahuja reports no disclosures.

**Dr. Egbert** received his bachelor's of science in medical biology at the University of Utah and his doctor of dental surgery at Creighton University in Omaha. He then pursued a full-time 3-year residency in advanced surgical prosthodontics at the University of Tennessee Health Science Center. During his residency, he earned his master's of dental science evaluating the accuracy of CT-generated implant guides, and he also led clinical research projects comparing the efficacy of modern bone-grafting techniques. He is certified by the ADA and Utah Dental Association to provide safe intravenous moderate sedation. One of 4 board-certified prosthodontists in Utah, he currently serves as the president of the Utah Prosthodontic Society. He is in private practice in Salt Lake City. He can be reached at nicholasegbert@gmail.com.

Disclosure: Dr. Egbert reports no disclosures.

**Dr. Wicks** is professor and chair of the department of prosthodontics at the University of Tennessee (UT) Health Science Center, College of Dentistry in Memphis. He received his dental degree from UT in 1978 and a master's degree and certificate in the specialty of prosthodontics from the University of Texas at San Antonio in 1993, and was in private general practice from 1979 to 1990. He has conducted prosthodontic research and directed the undergraduate curriculum in removable prosthodontics and dental implants at the UT College of Dentistry. He also holds membership in a variety of professional honorary and service organizations, and in 1995, the American College of Prosthodontists recognized him as the "Outstanding Young Prosthodontist" in America. He has authored more than 30 publications in the prosthodontic literature. He can be reached at rwicks@uthsc.edu.

Disclosure: Dr. Wicks reports no disclosures.

**Dr. Brandt** is professor and director of the advanced education in general dentistry and is in the department of prosthodontics at the University of Tennessee (UT) Health Science Center, College of Dentistry in Memphis. He received a certificate in the specialty of prosthodontics from the Wilford Hall Medical Center Lackland AFB Texas in 1975. He joined the faculty at the University of Florida as an assistant professor of prosthodontics in 1988, afterwards holding university appointments in University of Queensland, Brisbane, Australia; Nova Southeastern University; and University of Tennessee. He has conducted prosthodontic research and directed the undergraduate curriculum in implant dentistry and occlusion at the UT College of Dentistry. He has authored more than 25 publications in the prosthodontic literature and holds memberships in a variety of professional honorary and service organizations. He can be reached at rbrandt@uthsc.edu.

Disclosure: Dr. Brandt reports no disclosures.