



Going Digital: 3D Data Capture for the Fabrication of Titanium Frameworks

BY STEPHEN SCHMITT, DDS, MS, and REED SCHMITT, MS

Improvements in implant protocols, digital imaging, computer-aided design and numerical-controlled milling make removable restorations a practical and good long-term solution. The NextSmile virtual technique and service offers laboratories a way to fabricate custom-milled titanium frameworks without the need for a facebow, record bases, the initial physical setup of denture teeth, or the creation of an acrylic pattern to be scanned. Here's an overview of the process:



Stephen Schmitt, DDS, MS, developed the NextSmile process to design and manufacture titanium frameworks/substructures for laboratories and dentists. He is the former Chairman of the Department

of Prosthodontics and Program Director for the Graduate Prosthodontics Program at Wilford Hall USAF Medical Center and actively involved with several prosthodontic groups.



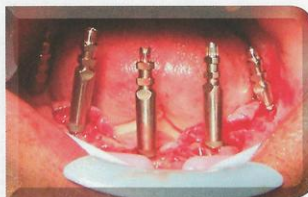
Reed Schmitt, MS, is Chief Technology Officer at NextSmile. He has worked with Texas A&M's Pre-Dental Society, Project Smile, as well as the National Science Foundation where he assisted in creating 3D-rendered

models from CAT-scan data.

For more information on the NextSmile virtual technique and service, call 800-243-4145, email services@schmittdds.com or visit www.nextsmile.com.



Figure 1 A CT scan of the patient's head and face is taken to determine the condition of his teeth and facial bones and implant placement. This CT scan shows the patient's mobile and periodontally hopeless teeth; there's little bone on the front of the anterior teeth. Using a CT Byte™ during the CT scan allows the CT scan to be joined with the model scans and eliminates radiographic scatter, the need for a facebow or a radiographic template.



Figures 2 & 3 Computer-generated drill guides are used to place and load the six maxillary and five mandibular implants, both with transfer copings.



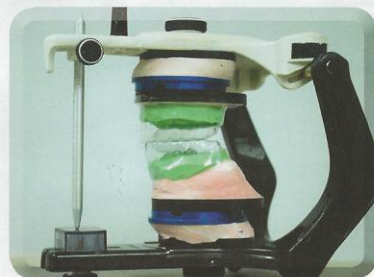
Figure 4 On the day of surgery, master casts with implant analogs are made by the dentist or a technician trained in the technique.

Figure 5



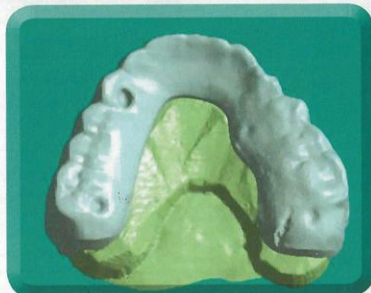
The patient wears the upper and lower immediate-load fixed provisional restorations for four months. After the healing phase, the jaw relation records are made by the dentist and the provisional restorations are removed and attached to the master upper and lower casts and mounted.

Figure 6



The dentist uses a specially designed articulator with mounting plates that can be moved to a scanner or mill so he controls where the dental casts are in relation to the virtual model; it also eliminates the need for a conventional facebow. All scanning, milling of occlusion and processing can be accomplished on the same cast and plate, eliminating errors and time. The mounted casts are then removed from the articulator and Accurate Set putty is adapted under the provisional prosthesis to capture its shape and eliminate any undercuts. Next, 0.020" of Ellman International's stent material (Ellman Press Form Sheets) is vacuum formed over the provisional prosthesis and onto the stone cast so the prosthesis can be removed and the stent material replaced on the cast in the exact same position. The provisional restorations are placed back in the patient's mouth.

Figure 7



The upper and lower casts (with analogs), putty and the 0.020" of stent material are shipped to NextSmile, in San Antonio, TX, to be digitally scanned and then combined into one image. If changes are noted in the tissue and the shape of the healed ridge needs to be recorded, an impression of the soft tissues with healing abutments attached to the implants is made and also sent to NextSmile for scanning. The scan of the healed ridge can accurately be positioned in the same scanned image.

Figure 8



A composite 3D image of the restorative space, denture teeth and titanium framework is developed and the design is emailed to the lab for review in SolidView Lite, free software provided by NextSmile.

Figure 9



Once the lab and restorative dentist approve the design, the titanium framework is milled in one day and sent to the laboratory for setting teeth and a wax try-in (if NextSmile sets the teeth there's a two- to three-day turnaround). The teeth are processed to the framework with Ivoclar Vivadent's Ivocap Preference Implant resin which creates a strong mechanical bond and eliminates the need for pink opaque since the resin is 80% opaque yet esthetic.

Figures 10 & 11



The completed prosthesis.

A composite 3D image of the restorative space, denture teeth and titanium framework is developed and the design is emailed to the lab for review in SolidView Lite, free software provided by NextSmile.