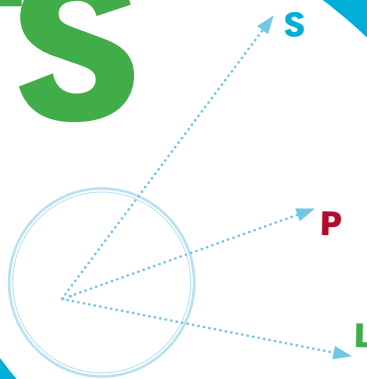


The changing FACE of IMPLANTS

Labs planning to stay in the implant arena should take note of how 3D imaging technologies and treatment planning software are altering how implant teams work together.

By Richard Palmer



Implants as a viable option for prosthetic restorative treatment is one of the fastest growing business segments in the dental technology industry and offers astute business owners unlimited potential. More patients are asking their dentists for them, more GPs are placing them, and laboratories are providing more of them than ever before. Because the field of implantology can involve more complicated procedures than the traditional supragingival crown-and-bridge or denture casework, the trend is moving toward a true team approach with all parties—clinicians, oral surgeons, prosthodontists, and laboratory technicians—communicating from the very beginning of the case. This new fellowship of team communication is being simultaneously facilitated and augmented by next-generation technologies as well as forward-thinking business models that only stand to continue this growth.

SEEING IS KNOWING

Leading the way in this technological revolution for implant treatment is the development and implementation of advanced digital radiographic imaging protocols that allow three-dimensional views of all oral and

maxillofacial structures, including the bone, nerves, teeth, roots, and soft tissue. Cone-beam computed scanning tomography (CBCT), also referred to as cone-beam volumetric tomography (CBVT), captures the patient anatomy in undistorted three-dimensional cross-sectional and axial images. These sections can be viewed individually much like traditional x-ray radiographs.

However, adding to the visualization power of CBCT data, powerful software programs have been developed that combine the slices together into a 3D image, which allows complete visualization and assessment of vital structures. This image can be viewed and manipulated by the clinician and the oral surgeon in consultation to analyze the implant site(s) to determine presurgical considerations such as bone and soft-tissue condition and whether any bone augmentation or gingival grafting are needed before the implant treatment planning should proceed.

“In most of the cases I handle, I’m dealing with a situation where the bone is not ideal, the soft tissue is not ideal,” said Dr. Scott D. Ganz, a specialist in prosthodontics, maxillofacial prosthetics, and implant dentistry with a private practice in Fort Lee, N.J. “Often what’s missing is not just the

tooth, but the tooth, soft tissue, and the bone.”

The digital CBCT scanning procedure can be performed in practically any location, including dental practices, medical facilities, specialized imaging ser-

vice bureaus, or dental labs. Back in 2005, Microdental Laboratory (now part of DTI) was one of the first dental laboratories to incorporate CBCT radiographic equipment on-site as a service to its implant clients through

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PAST JUST PROSTHETICS

According to **Renzo Casellini, MDT**, certain devices the technician can fabricate both enhance the detailed communication necessary for optimal implant treatment and provide an extra source of revenue.

1. Created from patient images, study models, and clinician instructions, a diagnostic wax-up (**Fig. 1**) shows the desired final restoration in terms of tooth shape, size, and position.



2. Based on the approved diagnostic wax-up, a vacuum-formed acrylic appliance with barium sulfate teeth is fabricated (**Fig. 2**) then placed in the patient's mouth (**Fig. 3**) for use in capturing CBCT scan images. The radiopaque teeth show the relationship of the dentition to the bone and maxillofacial features to assist in planning implant position for surgery.



3. The surgical guide stent can be fabricated with titanium sleeves for the surgeon's drill. This type of stent can either be made by the technician in the lab (**Fig. 4**), or the CAD data can be sent electronically to a company that produces a precision appliance using CAD/CAM technology (**Fig. 5**).



the use of Imaging Science's i-CAT 3D Cone Beam dental scanning technology.

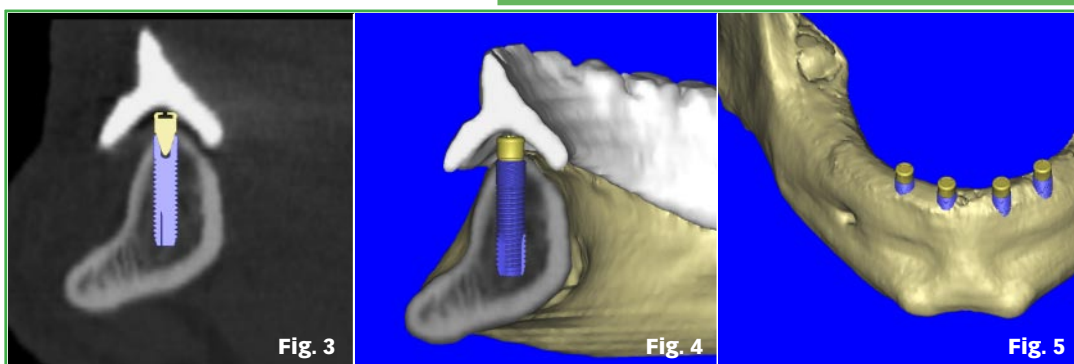
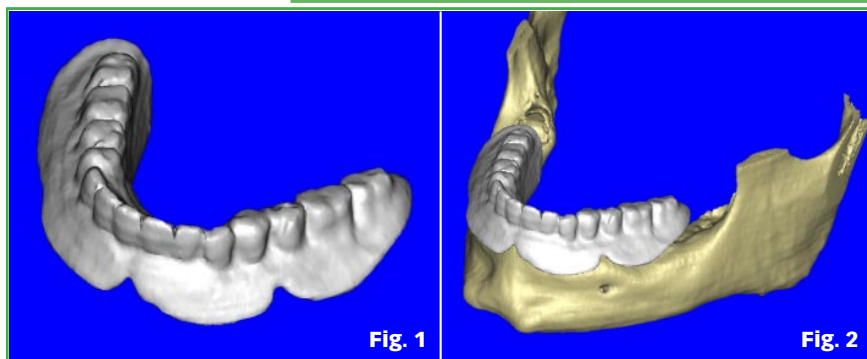
With the decreasing cost of CBCT technology over the past few years, smaller business operations like Lemke Dental Laboratories Inc. in Roseville, Minn., have followed suit, offering the expanded service of CBCT scanning to clients. The expanded service affords optimal implant case communication and brings in new business. According to owner Dennis Lemke, CDT, "We invested with oral surgeons in the i-CAT technology and bought the software at cost. They're able to design their cases better and more thoroughly."



SCANNING FOR PLANNING

Next-generation 3D planning software allows **Dr. Scott D. Ganz** to virtually plan implant site locations for implant-retained denture treatment.

1. The diagnostic wax-up or duplicate denture is fabricated by the lab as a radiopaque guide for CT scanning (**Fig. 1**).
2. A 3D reconstruction of the patient's mandible from CT scan data with the scan prosthesis in position can be rotated on-screen to analyze additional anatomy (**Fig 2**).
3. The radiopaque scan prosthesis seen in the cross-sectional CT image shows the relationship of the tooth position to the underlying bone. Virtual implants can then be properly positioned (**Fig. 3**).
4. Advanced 3D tools show a realistic implant and Locator attachment placed within the envelope of the desired tooth position (**Fig. 4**).
5. Four virtual implants with Locator attachments visualized on the 3D image of the mandible indicate surgical placement (**Fig. 5**).



Mark Marinbach, CDT, Owner of Nu-Life Long Island in West Hempstead, N.Y., sees a coming universal integration of CBCT scan technology. "This whole arena is gaining in popularity and is definitely the future of implant planning surgery and prosthetics," he predicted. He likens the widespread acceptance of digital CBCT radiography to the use of traditional x-rays in the dental office. "Not every dentist will own a CBCT scan machine, but they will have access to them."

READ 'EM AND REAP

While CBCT imaging hardware continues to become more economical for more businesses to purchase or lease, accompanying software advancements allow for sharper, highly defined images. However, the ability to comprehend and interpret the CBCT scan images remains crucial to developing a comprehensive implant treatment plan, from site placement to abutment selection. It also offers those with the training and skills in reading and analyzing the images a new businesses model.

As Dr. Ganz said in his course on CBCT technology at the International Congress of Oral Implantologists Winter Symposium in Las Vegas (see "Learn in Las Vegas" on page 24), "It's not the scan, it's the plan." He added, "The software still has to be the backbone of the planning aspect. The data doesn't do anyone any good unless you can interpret and then treatment plan accordingly."

Lemke commented that his laboratory employs a technician specially trained in reading the 3D images who frequently visits the dental practices to help with the case planning from a prosthetic viewpoint. "With our ability to run the software, we've become very valuable to the oral surgeon and the periodontist," he said. "That helps get us into the oral surgeon and periodontist office also. They want to see us."

In addition, Lemke organizes study clubs where he instructs on the i-CAT system, along with other new technologies such as CAD/CAM. He has two CBCT-equipped locations now and plans to add two more. He is careful to emphasize that the technician does not actually prepare the surgical treatment plan or implant placement guidance, but simply provides advice and input on case design.

While the ability to comprehend and interpret the CBCT scan images is crucial to developing the comprehensive implant treatment plan—from site placement to abutment selection to final prosthesis fabrication—some dental practitioners and laboratory technicians prefer to concentrate on what they know, feeling intimidated by the technology. They also would rather not bear the capital expense of high-tech equipment and the training involved to work with the software and prepare the CBCT data into a clean, readable 3D image. Acting as a specialized outsource partner, companies such as 3D Diagnostix Inc. (www.3ddx.com) and 360imaging (www.360imaging.com) have established business models that allow practices to send the raw CBCT data electronically for conversion of the DICOM files into a readable 3D image. Both services also have certified oral/maxillofacial radiologists to interpret the images and help plan the case as well as offer training in image interpretation (see "Welcome to the team" on page 22).

NEW BUSINESS

As cutting-edge CBCT scanning equipment and 3D imaging software continue to evolve, laboratory owners can and

should be an integral part of implant treatment planning from the very beginning.

“Everything is done before the surgery,” said Renzo Casellini, MDT, owner of Swiss Quality Dental Ceramics

and Dental Implant Studio in Westwood, Calif. Starting with his receipt of the study model and digital images from the clinician, Casellini goes over all aspects of the implant case—whether the prosthesis will be fixed or

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WELCOME TO THE TEAM

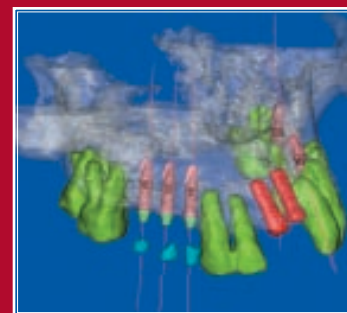
Expanding beyond the technician, the clinician, and the oral surgeon, the implant team now also can include outside services designed to help streamline the treatment process while minimizing confusion. With zirconia restorations gaining in popularity, a growing number of lab owners have opted to outsource the designing and/or production of the substructures to laboratories that have made the investment in equipment and personnel. Similarly, with implant-based crown and bridge or denture restorations experiencing wider acceptance, a number of businesses have opened shop to let labs expand their implant casework.

Working from patient CT scans, 3D Diagnostix (www.3ddx.com) and 360imaging (www.360imaging.com) convert the DICOM data into a 3D image that can be used



for treatment planning, including custom colorization of the teeth, bone, and nerves, as well as radiographic interpretation services provided by board-certified oral and maxillofacial radiologists. In addition, both companies offer on-site training courses on working with the 3D images or the CT scan equipment.

Getting the entire implant team on the same (Web) page is the concept behind iConfiDent (www.iconfident.com). The secure, Internet-based program is designed to share communication among clinicians, labs, and specialists



to facilitate implant material selection, tracking, and ordering. It organizes case information, including images, x-rays, and notes, in a centralized, password-protected location that can be accessed 24/7 from any Internet-connected computer.

30.8%

The percentage increase from 2007 of doctors prescribing CAD/CAM-milled custom abutments.

SOURCES: DLP JANUARY 2008 AND JANUARY 2007 IMPLANT SURVEYS.

removable, screw-retained or cemented, abutment type, and tooth size and shape. "Those are all the things that need to be discussed before the surgery," he said.

From this case information, Casellini creates a diagnostic wax-up to show the patient the potential final restorative outcome. From the patient- and clinician-approved wax-up, he fabricates an acrylic guide used for the CBCT scanning that includes radiopaque teeth to show their relation to the bone and other maxillofacial features on the scan image to help in the planning of the implant surgical site (see "Past just prosthetics" on page 18).

"When we plan the implant, we know where the tooth is going to go," said Dr. Ganz. "That to me is true

restoratively driven implant dentistry. The goal of implant dentistry is not the implant, it is the tooth. And who will ultimately be responsible for creating that tooth? The dental technician."

Traditionally, labs have worked from master models marked by the oral surgeon with the implant location and angulation. The technician fabricates a guide stent from vacuum-formed acrylic and drills holes for titanium pilot sleeves that guide the surgeon's drill during implant placement surgery (See Robert Kreyer's column, "Fabricating implant surgical guides" on page 46 for a step-by-step example). Bringing another high-tech aspect to implant surgery, surgical guide stents such as Materialise Dental's SurgiGuide (www.materialise.com/materialise/view/en/554529-SurgiGuide.html) or Nobel Biocare's NobelGuide (www.nobelbiocare.com/global/en/ClinicalProcedures/NobelGuide/default.htm) alternatively can be produced via CAD/CAM components to the exact site, angulation, and depth as determined by the oral surgeon with the computer planning software. Other companies such as Biomet 3i are capitalizing on this technology and partnering with a number of companies for virtual treatment software planning and surgical guide fabrication for clinical and technical use of their implant line.

Learn in LAS VEGAS

While gamblers at the Bellagio Hotel in Las Vegas pressed their luck at winning the jackpot in the casinos, dental professionals gathered at the **International Congress of Oral Implantologists (ICOI) Winter Symposium** Feb. 7-9 for a sure bet: the opportunity to learn from an international faculty of world-renowned educators in the field of clinical and laboratory implant treatment. Backed by its mission to encourage team implant learning, the ICOI presented a rich curriculum of hands-on workshops and focused symposia designed for clinicians, technicians, and auxiliaries together toward optimal patient care.

Lecturers at sponsored pre-symposium morning courses introduced attendees to or refreshed them on advanced surgical techniques as well as presented emerging technologies such as cone beam CT and treatment planning software. The scientific sessions held each day combined several programs under common topics, including case management, surgery, and new technologies. The Association of Dental Implant Auxiliaries (ADIA) hosted an auxiliary symposium that focused on direct patient care from pretreatment evaluation to communication to long-term maintenance. Tabletop/poster presentations provided yet another intimate learning opportunity. In addition, more than 70 manufacturers and suppliers of equipment, materials, and technologies were on hand in the tradeshow exhibit hall (right, top) to offer one-on-one information on implants, instruments, software, radiographic equipment, and services.

More than 200 clinicians and lab technicians who had completed the comprehensive requirements for Fellowship, Mastership, or Diplomate certification were recognized at the awards ceremony Friday evening (right, bottom).

Focusing more on the laboratory side of implant restorative treatment, the ICOI Implant Prosthetic Section (IPS) will host its annual Implant Prosthetic Symposium in Chicago Aug. 22-24. For information on program details or for registration, call the ICOI Central Office at 973-783-6300 or visit www.icoi.org.



PHOTOS: RICHARD PALMER (TOP), ICOI (BOTTOM).

PLANNING partners

From software programs designed to help clinicians and technicians virtually plan implant treatment from start to finish, to Web-based assistance in component selection and ordering, to outsource solutions geared to guide the implant team through the technological advances in implantology, to manufacturers offering patient-specific CAD/CAM abutments, an entire network is available for assistance for providing exceptional implant care.

360imaging

www.360imaging.com

3D Diagnostix Inc.

www.3ddx.com

3M ESPE

www.3mespe.com

Anatmage

www.anatmage.com

Atlantis Components

www.atlantiscomp.com

BioCad

www.biocad.ca

Biomedical Modeling Inc.

www.biomodel.com

Biomet 3i

www.biomet3i.com

BioParts Dental Slice

www.dentalslice.com.br

iConfident

www.iconfident.com

ident-surgical.com

www.ident-surgical.com

Implant Direct

www.implantdirect.com

Implant Logic Systems

www.implantlogic.com

IMTEC Corp.

www.imtec.com

IVS Solutions AG

www.ivs-solutions.de

KaVo Dental/Neoss Ltd.

www.neoss.com

Keystone Dental

www.keystonedental.com

Materialise

www.materialise.com

Med 3D

www.med3D.de

Media Lab Software Implant3D

www.implant3D.com

Medical Modeling

www.medicalmodeling.com

Nobel Biocare

www.nobelbiocare.com

n-Sequence Center for Advanced Dentistry

www.n-sequence.com

Tactile Technologies

www.tactile-tech.com

CAD/CAM technology also comes into play with the abutment selection and design. Beyond using stock abutments, technicians have the option of accessing custom abutment outsource companies such as Atlantis Components or Biomet 3i for CAD/CAM-milled patient-specific abutments in zirconia, titanium, or gold alloy, or alumina using CAD design software to design custom abutments in-house for CAM milling. Technicians can even mill abutments out of a resin-based material for traditional lost-wax casting procedures. Because he and his technicians have the impressive skills to hand wax custom implant abutments, Casellini said he still prefers this method; although he commented that he has been studying the possibilities of CAD/CAM 3D waxing technology.

In addition, the implant team can plan the case components and organize the selection process through Web-based applications such as the iConfident program (www.iconfident.com). The implant management portal has a feature called “myTeam” that allows clinician, surgeon, and technician to share case information securely online, including images, x-rays, and notes. The team can select from multiple implant manufacturers and choose the correct parts for the case. The application soon plans to add the ability to include custom abutment selection into the process as well as handle DICOM-based CBCT images.

“The goal of implant dentistry is not the implant, it is the tooth”

– Dr. Scott D. Ganz

NEW FRONTIERS

With all the changes coming into the field of implant-based restorative dentistry, laboratories have many options. They can incorporate computer-based solutions into their operations as a service to their clients through case planning or through fabricating aids for guided surgery while still retaining some of the hands-on craftwork they have developed over the years. The key is to get involved with the planning at the onset, and involvement starts with education.

Teaching facilities such as the Misch International Implant Institute (www.misch.com) or the Midwest Implant Institute (www.midwestimplantinstitute.com) as well as professional associations like the ICOI (www.icoi.org) or the American Academy of Implant Dentistry (www.aaid-implant.org) offer team-based training for comprehensive implant education.

The ICOI’s Implant Prosthetic Section (IPS) goes a step further by providing symposia focusing on implant restorative practice techniques and laboratory innovations. Casellini will be installed as IPS President at its 11th annual Implant Prosthetic Symposium Aug. 22-24 in Chicago. Referring to the IPS’s rigorous Certified Implant Prosthetist program, he said “We bring together dentists, prosthodontists, and technicians up to our level so they can be certified.”

Lemke also believes that learning is not just the starting point in implant prosthetics, it is the point. “You have to educate yourself. The laboratory has become more of an integral part of the restorative team today than ever before, and the dentists are starting to lean more on us to help. If you don’t get involved, you won’t be here because the demand is greater than ever.” **lab**

88%

Labs that have seen across-the-board growth in their implant business over the past five years, with almost 10% reporting increases of more than 40% during that time.

SOURCE: DLP JANUARY 2008 IMPLANT SURVEY.

Web Extra – For a schedule of upcoming implant learning opportunities as well as the results of our exclusive implant survey of lab owner/managers, log on to our Web site at www.dlpmagazine.com.

