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Guided Implant Surgical Applications

🕒 01 Dec 2015 👤 Michael Tischler, DDS

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These combined CBCT and prosthetic disciplines go one step further; when technology allows clinicians to have interactive communication through online modalities...the surgeon, the radiologist, and the prosthetic doctors can collaborate as a team, producing a plan implemented through surgical guides.

This month's Implants Today is focused on dental implant surgical guides. A surgical guide for implant placement is a comprehensive blend of many technologies that translates to improved care for our patients. It was only in 1979 that Hounsfield and Cormack received the Nobel Prize for Physiology and Medicine for developing the diagnostic technique of x-ray computed tomography (CT). Here we are, 36 years later, and we can routinely place dental implants through a guide that is computer assisted designed (CAD) and computer assisted milled (CAM), created from information obtained by a CBCT scan. Not only is this a blend of technologies, but the true success of a surgical guide for dental implant placement is the combination of taking those technologies and making them work in concert with a plan for the prosthetic end result. Because of this melding of a prosthetic goal with technologies that support it, implant dentistry treatment planning has now entered a stage that is extremely predictable and safe on every level. These combined CBCT and prosthetic disciplines go one step further; when technology allows clinicians to have interactive communication through online modalities (ie, Skype and GoToMeeting), now the surgeon, the radiologist, and the prosthetic doctors can collaborate as a team, producing a plan that can be implemented through surgical guides. This, in my opinion, is ideal treatment planning through a team approach and treatment.

One important key to success with a surgical implant guide is to create a guide, or a series of guides, starting with accurate diagnostic records. This includes detailed impressions especially for tooth-supported guides and accurate face-bow transfers for larger and full-arch cases. One key starting point for guide cases is capturing a CBCT scan with radiopaque teeth on a prosthesis, then being able to see the tooth positions on a CBCT scan for a surgical plan based on the prosthetic position desired. Another option is to take a dual-scan technique where radiopaque markers are placed on a prosthesis, then a CBCT scan of the prosthesis is taken both inside and outside of the mouth. The 2 scans are then correlated in a CBCT software program and then a prosthetic-based surgical plan can be made. The information from either type of these 2 scan techniques, allows planning not only for implant positions but also to determine if either grafting or alveoloplasty are needed. These diagnostic records and radiopaque scans are the starting point for either an online meeting planning session or planning session within a clinician's office using one of the many available CBCT planning software options.

Surgical guides are planned either from a tooth- or soft-tissue-supported (eg, when a patient is edentulous) clinical situation. A tooth-supported guide offers the most stable reference for a surgical guide. Accurate impressions are important so that a surgical tooth-supported guide fits accurately over the existing teeth. Impressions for this can also be taken with one of the many optical scanners available, and a working model can then be made from the scan. When teeth are stable and support a guide well, the guide can provide a very simple and accurate implant placement for one or multiple teeth. Utilizing an implant manufacturer's or guide company's kit, implants can be placed through a guide using guide sleeves. The option also exists to utilize a guide for the initial osteotomy preparation, and place the implants freehand, gaining an improved tactile sense. This has been labeled template-assisted surgery in the literature by Dentistry Today's implant advisory board member Dr. Scott Ganz.

When a full dentulous or an edentulous arch is being treatment planned for dental implants, surgical guides become more complex on every level, from the planning to implant placement and alveoloplasty, if needed. In the maxilla, a patient's aesthetics and lip-line become an integral part of the planning process that will then be related to implant positions. When creating a prosthetically based surgical plan for a full arch, occlusion, the anterior-posterior spread, aesthetics, alveoloplasty, bone augmentation, provisionalization (and more), become topics that need to be more seriously considered than when treatment planning simply a quadrant of implants.

In my opinion, the biggest challenges in full-arch reconstruction and treatment planning with a surgical guide are with the treatment of cases that involve removing an entire arch of teeth and then relying on a guide for alveoloplasty and implant placement. Once an entire arch of teeth are removed, the occlusal reference is now eliminated and all of the pre-planning with a guide becomes dependent on the accuracy of the plan and how the guide fits onto the remaining bone after tooth removal. Surgical guide systems now exist that address this challenging issue.

With the refinement of CBCT scan technology and adjunctive CAD/CAM and communication technology, implant surgical guides can offer many solutions to assist in varying clinical situations. The current surgical guide systems address every situation, from partial- to full-arch edentulism. As technology improves even more, guided surgical assistance will further the clinical successes that we see now.

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