

The Examiner

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The Use of Three Dimensional Imaging for Treatment Planning and Placing Dental Implants

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- Practice Limited to Periodontics and Dental Implants
- Comprehensive Treatment Planning with Team Approach to Dental and Implant Therapy
- Achieving Excellence in Dentistry

Implant therapy is the standard of care for the replacement of missing dentition. Success rates ranging from 95-98% have been shown on a consistent basis in long term studies. Although achieving osseointegration is no longer a challenge, the placement of a restoratively driven implant that will guarantee a functional and esthetic restoration remains problematic. The implant therapy becomes even more challenging as the number of implants placed on one arch increases as well as the complexity of the restorative case. The use of three dimensional radiographic imaging in addition to CAD-CAM technology can offer a solution for implant therapy in complex surgical and restorative cases.

Treatment Planning for Dental Implants:

Careful planning is the key to a successful outcome in implant dentistry. Diagnostic models, wax-up and appropriate radiographs are necessary prior to proceeding with the placement of dental implants. Computerized tomography (CT Scan) is becoming the standard of care for treatment planning and placing dental implants.

The Advantage of Computerized Tomography:

Using the appropriate reformatting software, a wealth of information can be extracted from the CT Scan:

1. The width and height of the residual bone can be calculated.
2. Bone quality is easily determined.

3. The anatomy of the maxillary sinus and the presence of pathology can be studied.
4. Determination of the location and proximity of important anatomical structures such as the mandibular nerve, the incisal foramen, and mental foramen.
5. Determination of proximity to adjacent root apices.

The Radiographic Surgical-Restorative Connection:

In order for the placement of the dental implants to be completely restorative driven, a diagnostic wax up has to be made at the beginning of the treatment planning process. A radiographic stint can be easily fabricated out of the wax up by mixing acrylic and *barium sulfate* (a radiopaque powder) to make a radiopaque stint that mimics the final restoration. The patient will wear that stint during the CT session in order to incorporate the restorative treatment plan into the CT image.

The SimPlant® Software:

The **SimPlant® Software** is a powerful tool that allows the CT Scan image to become completely interactive. The periodontist and the restorative dentist are able to insert the CT Scan data in the PC and treatment plan the case taking into account the quality and quantity of the present bone in addition to studying all the relevant anatomical structures. The number, width, length and brands of implants can be all predetermined using this tool. The radiographic stint allows to accurately plan the position and angulations of

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Figure 1: Radiographic Stint. The missing teeth are made of a mixture of acrylic and *barium sulfate*. The patient wears the stint during the scanning procedure.



Figure 2: A cross section view showing the proposed position of the implant. Note the long axis of the implant exiting through the cingulum of tooth # 11.

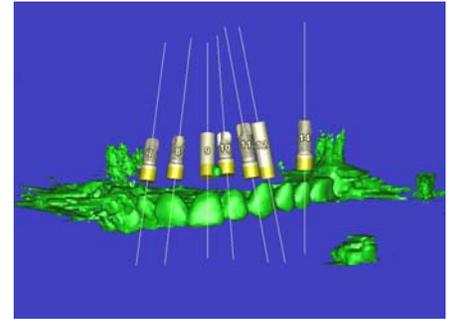


Figure 3: A 3D composite of the CT scan showing the proposed position of all the implants in relation to the teeth on the radiographic stint.

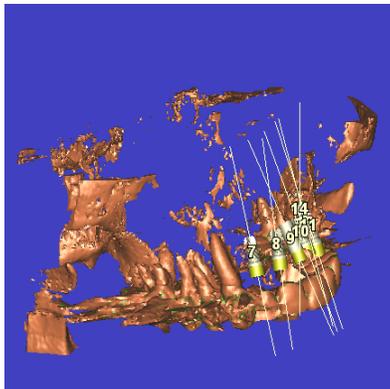


Figure 4: 3D composite of the CT scan showing the implants in relation to the adjacent teeth.



Figure 5: The surgical guides for the placement of the dental implants with increasing diameters of the drilling holes according to the original plan.



Figure 6: A stereolithographic model of the maxilla made of the CT scan showing the alveolar ridge and the remaining teeth.

the implants.

How does it all come together?

Once the treatment plan using the SimPlant® Software is complete, the file is saved and mailed to Materialise Corporation in Belgium. Using CAD-CAM and laser technologies, a series of surgical guides corresponding to the treatment plan are made. The guides are used to accurately place the implants in the predetermined positions.

Case Study :

This 70 year old patient presented for the replacement of teeth # 7 through 14. The treatment options were given to the patient and included a removable partial denture or dental implants with an implant supported fixed partial denture. Diagnostic models were made and a radiographic stint was fabricated (Figure 1) . The patient was referred to the imaging center where a CT scan of the maxilla was made. The radiographic stint was inserted in the mouth prior to starting the scan. The data obtained from the scan was analyzed using SimPlant® software

and the treatment plan was completed (Figure 2). The number of implants to be placed, the positioning and the sizes were all predetermined (Figures 3 & 4). The information was sent to Materialise where a series of surgical guides corresponding to the diameter of the implants were made (Figure 5). A stereolithographic model of the maxilla was also made in order to examine the fit of the surgical guides pre-surgically (Figures 6 & 7). The surgery was started by anesthetizing the patient and a full thickness flap was reflected. The surgical guide was adapted to the bone and positioned properly to start the preparation of the osteotomies (Figures 9 & 10). The implants were placed according to the plan and the case was completed (Figures 11 & 12). After three months of healing, a second stage surgery was performed to place the healing abutments (Figure 13). The patient was then released to the restorative dentist to start the restorative treatment. An eight unit fixed partial denture was fabricated and cemented according to the initial plan (Figures 14 & 15).

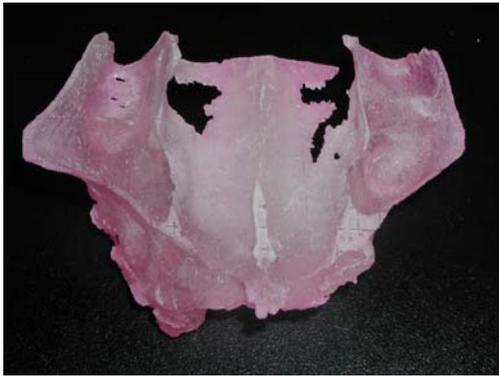


Figure 7: The same stereolithographic model of the maxilla. Note the maxillary sinuses, the floor of the nose and the nasal septum.



Figure 8: A preoperative clinical view of the alveolar ridge.



Figure 9: The Bone-Supported surgical guide in place on the alveolar ridge after the flap reflection.

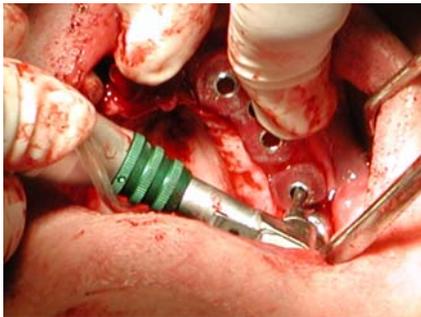


Figure 10: Preparing the osteotomies using the surgical guide according to the initial plan.

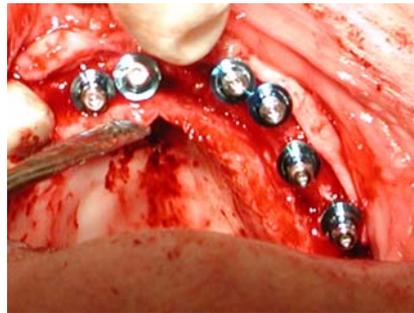


Figure 11: The implants (Implants Innovation Incorporated, 3I) placed using the surgical guides.



Figure 12: The final positions of the implants with the healing screws in place.



Figure 13: The implants at 2nd stage surgery after the placement of the healing abutments.



Figure 14: Extra-oral picture of the final prosthesis. An eight unit fixed partial denture over implants was made and cemented to the abutments.



Figure 15: Intra-oral picture of the final prosthesis. (Restorative Dentist: Dr. Warren Berne).

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Photos from our Annual Thanksgiving Luncheon

**We always look forward to the traditional
Thanksgiving Luncheon at our office in
appreciation of our referring dentists
and their staff.**

**Thanks to everyone who attended the
event to help kick off the holiday season.**

**We always enjoy mingling with the
dentists and their staff and hope to see
everyone next year!**

