

Utilizing Digital Treatment Planning and Guided Surgery to Restore Fully Edentulous Arches with the All-on-4 Technique



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We now have access to technologies that greatly enhance our abilities to restore our patients with high precision in a shortened treatment time utilizing a minimally invasive surgical procedure. This case report will demonstrate several of these technologies. Utilizing Glidewell Laboratories' Digital Treatment Planning Services allowed me to easily integrate these technologies into my practice.

There are several treatment planning software programs on the market. These programs allow you to virtually plan your cases utilizing CT scans. Scanning the patient with an appliance that has the teeth to be replaced in the ideal positions allows you to digitally plan the case from both the surgical and prosthetic perspectives, making it a truly restoratively-driven process. Because Nobel Biocare implants were to be placed, the NobelGuide™ System (Nobel Biocare; Yorba Linda, CA) was utilized for this case. The case was planned following the All-on-4 technique.^{1,2,3} This design involves tilting the distal implant on each side of the arch distally in order to improve the anterior-posterior spread and provide posterior support for the prosthesis. Using stereolithography, a Surgical Template was produced to transfer the digital plan to the clinical setting. An immediate screw-retained provisional restoration was delivered at the time of surgery through a flapless procedure.

This technology can be used to completely rehabilitate a fully edentulous patient by placing the implants and delivering maxillary and mandibular provisional restorations in one appointment. These cases require meticulous attention to detail and must be staged correctly. I had restored more than 20 individual arches using the All-on-4 protocol prior to restoring both arches in one appointment. Working with Glidewell Laboratories and utilizing the Digital Treatment Planning software allowed me to make the major planning decisions pre-surgically.

PRE-SURGICAL WORK-UP AND DIGITAL TREATMENT PLANNING

The patient was a young male that had been edentulous for some time. His chief desire was to have a fixed restoration. Due to the amount of ridge resorption, screw-retained dentures were the restoration of choice.

Standard procedure was used to determine the ideal positions of the teeth. Impressions and bite blocks were used to fabricate and articulate the study models. A wax try-in was done to finalize the set-up.

Radiographic Guides were fabricated and the patient was sent for a CT scan. The DICOM files of the three scans (patient, maxillary Radiographic Guide and mandibular Radiographic Guide) were uploaded and sent along with my digital Rx to Glidewell's Digital Treatment Planning Department.

Following a Web-based teleconference, the plan was finalized. Due to the size of the implants that could be placed and the patient profile, six implants were planned in the maxilla — four in the anterior and two angled distally paralleling the anterior walls of the maxillary sinuses (Fig. 1-3).

The mandibular plan included four implants: two in the lateral incisor regions and two angled distally to improve the anterior-posterior spread (Fig. 4,5).

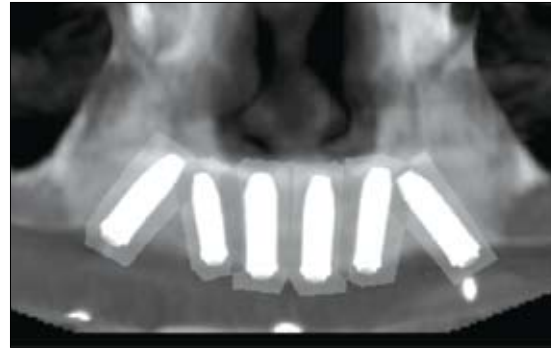


Figure 1: A panoramic view of the planned implants is shown in the scan.

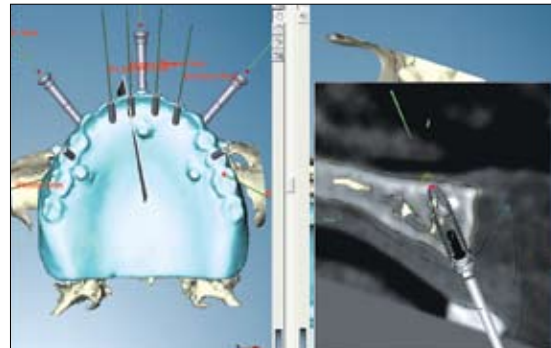


Figure 2: A digital plan of the implants and Anchor Pins is created.

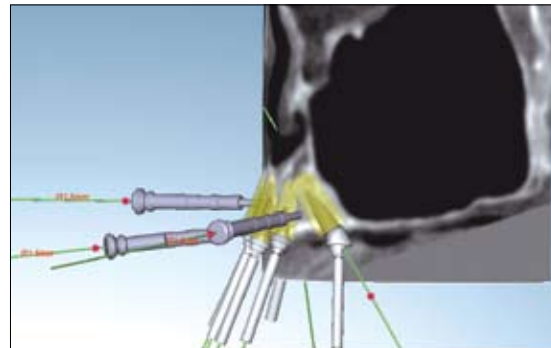


Figure 3: The implant parallels the anterior wall of the sinus.

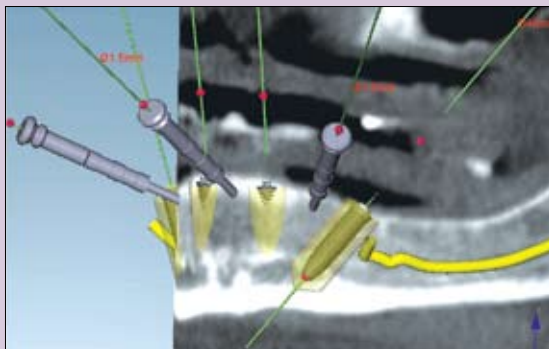


Figure 4: The implant is angled distally to improve the A-P spread.

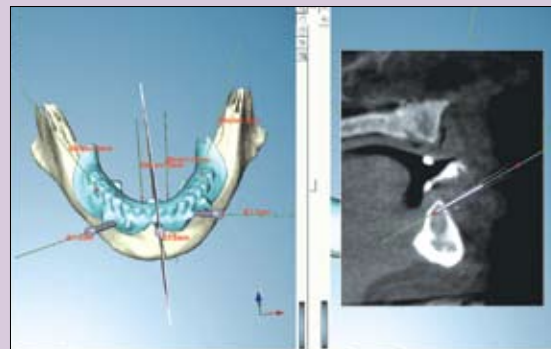


Figure 5: This is a view of the mandibular digital plan.



Figure 6: Master casts are fabricated from the Surgical Templates.



Figure 7: Reinforced provisional restorations are fabricated.



Figure 8: A Surgical Index is fabricated.

PRE-SURGICAL LABORATORY PROCEDURES

Once the plans were approved, the Surgical Templates were ordered from Nobel Biocare. Master casts were fabricated from the Surgical Templates (Fig. 6) and articulated utilizing duplicate dentures.

Provisional restorations were fabricated based on the approved set-up (Fig. 7).

Jigs were fabricated to correctly reposition each of the 30-degree Angled Multi-Unit Abutments in the mouth. A Surgical Index was fabricated to ensure accurate seating of the Surgical Templates (Fig. 8).

SURGICAL PROCEDURE

After obtaining adequate anesthesia, the Surgical Templates were seated in the patient's mouth with the Surgical Index (Fig. 9). The 1.5 mm Twist was used through the sleeves for the Anchor Pins in both arches.

The Surgical Index and mandibular Surgical Template were then carefully removed (Fig. 10).



Figure 9: The Surgical Templates and Index are seated intraorally.



Figure 10: The anchor pins are placed and the index removed.

The first maxillary implant was placed and a Template Abutment used to lock it to the Surgical Template (Fig. 11).

The second implant was placed in the #10 area with a Template Abutment. Between the three Anchor Pins and the two Template Abutments, the Surgical Template is held securely in place and the remaining osteotomies prepared (Fig. 12) and the implants threaded into place using the Guided Implant Mounts.

Healing Abutments were threaded into the implants to maintain the soft tissue opening during the mandibular surgery (Fig. 13).

The mandibular Surgical Template was seated and the Anchor Pins pressed into place (Fig. 14).

Standard NobelGuide procedure was followed to create the osteotomies and place the implants (Fig. 15).



Figure 11: The first site is prepared and the implant placed. A Template Abutment further secures the Surgical Template.



Figure 12: The remainder of the implant sites is prepared.



Figure 13: Healing Abutments maintain the soft tissue opening.



Figure 14: The mandibular Surgical Template is resealed and the Anchor Pins pressed into place.



Figure 15: The osteotomies are prepared and the implants placed.

PROSTHETIC DELIVERY



Figure 16: Jigs are used to correctly align the angled Multi-Unit Abutments.



Figure 17: This is what the Multi-Unit Abutments look like in place.



Figure 18: Prostheses are seated and the prosthetic screws tightened.

The jigs were used to deliver the 30-degree Angled Multi-Unit Abutments (*Fig. 16,17*).

The anterior implants were restored at the implant level (no abutments).

The remaining Healing Abutments were removed. The prostheses were delivered and the prosthetic screws tightened (*Fig. 18*).

A post-operative radiograph was taken to verify complete seating (*Fig. 19*).

Adjustments were made and a bilateral balanced occlusion was verified. The screw access openings were then sealed (*Fig. 20*) and post-operative instructions given.

Impressions for the final prosthesis will be made in approximately six months (*Fig. 21*).



Figure 19: A post-op radiograph verifies complete seating.



Figure 20a: The screw access openings are sealed.

CONCLUSION

The All-on-4 technique in combination with Digital Treatment Planning and guided surgery has allowed us to take a patient with a severely atrophic ridge from a poorly fitting denture to a fixed prosthesis in a precise manner with a shortened treatment time.

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Figure 20b: Mandibular Access openings are sealed.



Figure 21: The provisional restorations in place.