

Maximizing Full-Arch Rehabilitation Safety & Efficiency With Guided Surgery During COVID-19

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The ongoing global pandemic has put healthcare professionals around the world at the frontlines against unprecedented challenges. Consequently, many in the dental field are striving to keep their practices working safely during such crucial times and to be able to assist patients with the same efficiency while maintaining the required safety measures. For implant cases, the importance of a streamlined Computer Guided Surgery workflow has significantly increased as a means to meet such high standards of infection control without compromising efficiency.

In this case study we will demonstrate how adopting the latest Guided Surgery techniques can make complex full-mouth rehabilitation procedures safer by reducing chair-time, making the entire process predictable and condensing the entire workflow into a single surgical session.

Case presentation and administration

A 46-year-old female presented to the Kirkland Premier Dentistry office for a consultation, complaining from a chronic periodontic disorder, bad breath, loose non-restorable teeth (Figure 1) and the constant frustration of having root canal treatment done on her teeth, which was both time and money consuming. Upon examination, it appeared that a root canal treatment had failed at site number 10, at which an implant was placed, and it had been noted that site number 7 was failing as well, which required urgent intervention.

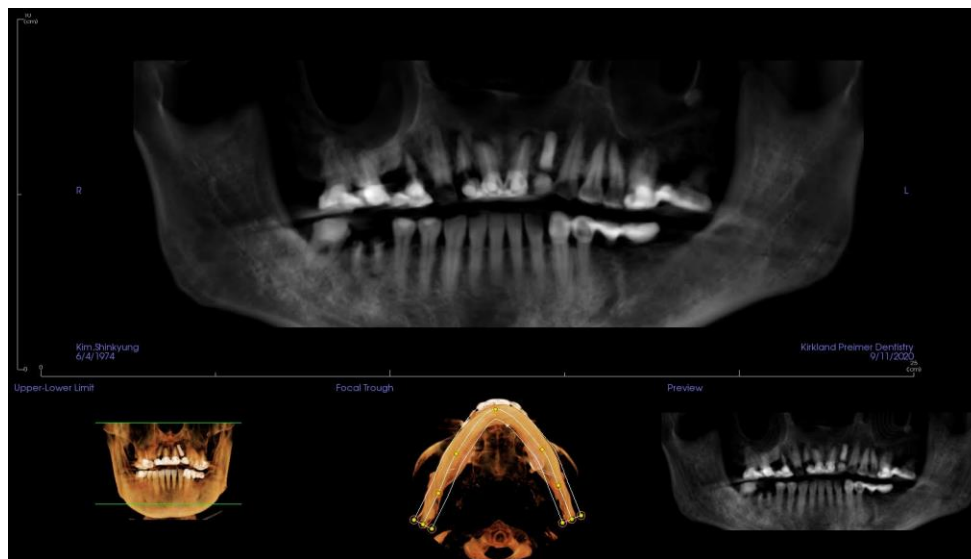


Figure 1: Preoperative CBCT panoramic image, showing chronic periodontal infection, bone loss, and an implant in site 10 with a radiolucency related to tooth 7.

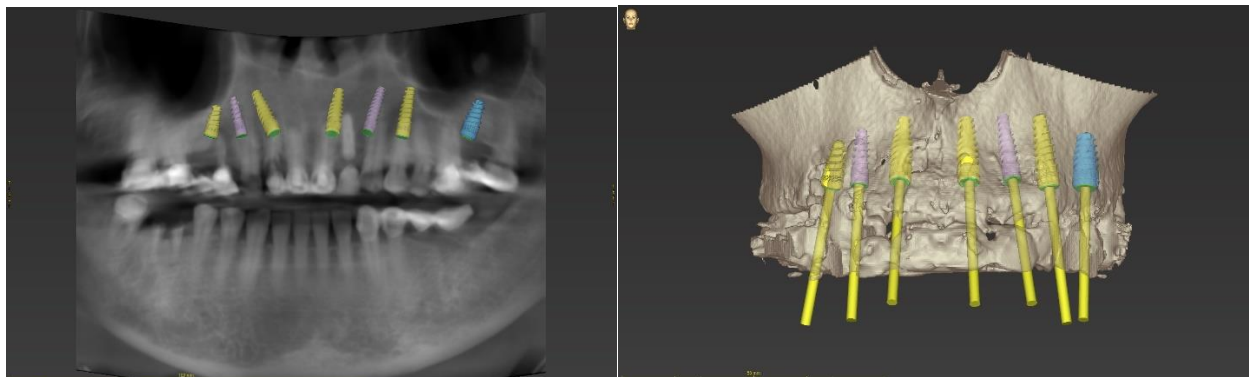
Case Planning

A CBCT scan and panoramic radiograph were taken using the office's Planmeca CBCT machine to accurately capture the information needed to properly treatment plan this case ensuring the most ideal outcome, especially since the patient discussed their frustration with previous treatment that did not last very long or address their primary needs or requests. For this patient, Hahn tapered dental implants were chosen for their unchallenged high implant stability at placement, which is a critical success factor for immediate load cases like this one

Using the 3D implant planning software (CoDiagnostix), Hahn implants were virtually placed in key positions for the preliminary plan. (Figures 2 and 3).

To further develop a treatment plan, diagnostic model impressions were taken, poured up and forwarded to 3D Diagnostix (3DDX) for digitization. These models were then digitally mounted on an articulator for further analysis in order to meet the patient's esthetic and functional needs.

A 3D virtual treatment plan was further developed and integrating with the photos and models with the assistance of 3DDX. An online fine-tuning meeting with a 3DDX dentist allowed for a comprehensive review of the assembled digital and clinical information formulating an optimal treatment plan that would fulfill the necessary requirements for esthetics, form, and function (Figure 4).



Figures 2 and 3: Proposed treatment plan using 3D-reconstruction views through 3DDX.

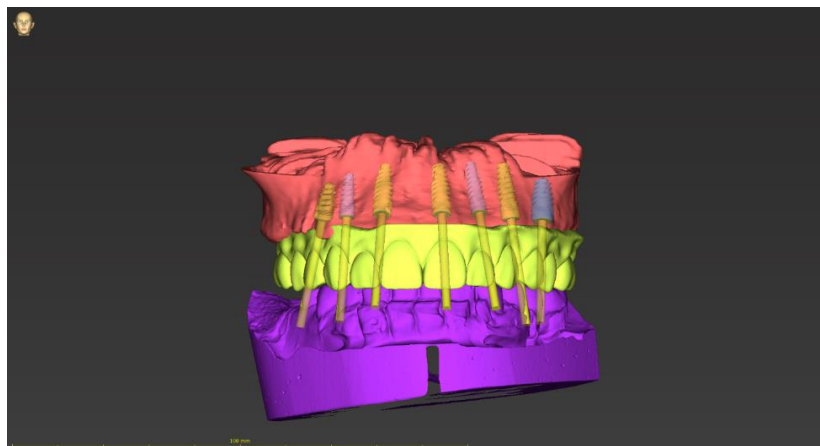


Figure 4: 3DDX virtual treatment plan in relation to wax-up and in occlusion to articulated mandibular models.

Next, the finished implant plan was transferred to a 3DDX Prosthodontist to design the Guided Full Mouth Restorations (GFMR) components.

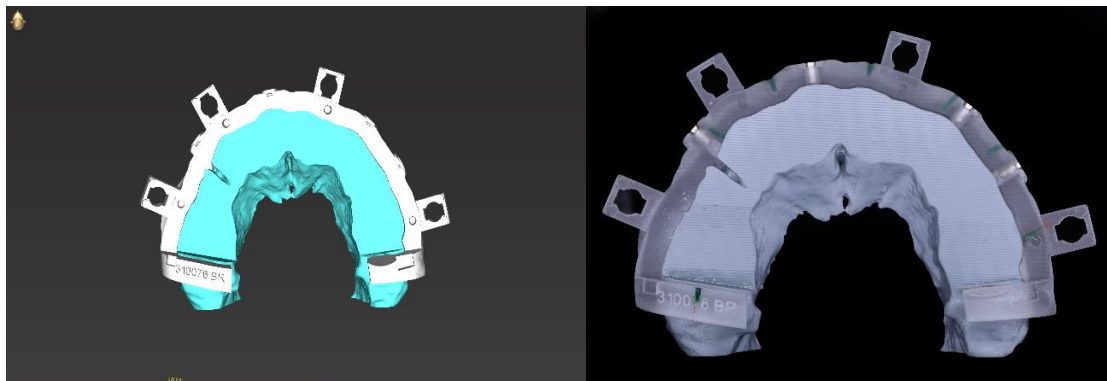
3DDX has designed their full mouth rehabilitation solution (GFMR) with a stackable sequence, so their prosthodontist proceeded to digitally design a retention-pin positioning guide, bone level guide, implant surgical guide, abutment guide and the temporary hybrid restoration.

Once all that was reviewed and agreed upon, these components were approved for production.

Implant Surgery

Now that the digital part was completed, the next appointment would be the planned surgery. The aforementioned 3DDX GFMR components were delivered a few days before the scheduled surgery date along with a printed breakdown of the plan and surgical protocols for the case.

After taking the required precautionary pre-surgery measures, the patient was appropriately IV sedated, and local anesthesia was administered. First, the pin-positioning guide was seated over existing teeth to help mark where the bone level guide should be seated. This is essential to ensuring accurate implant placement and a perfect fit for the temporary denture at the final stage. A full-arch flap was reflected, followed by the maxillary teeth being atraumatically extracted, so that the bone leveling surgical guide could be fully seated and fixed with its retention pins at the locations pre-marked with the help of the Pin Positioning Guide (Figures 5, 6 and 7).



Figures 5 and 6 : Digital design to the bone reduction guide (Codiagnostix),

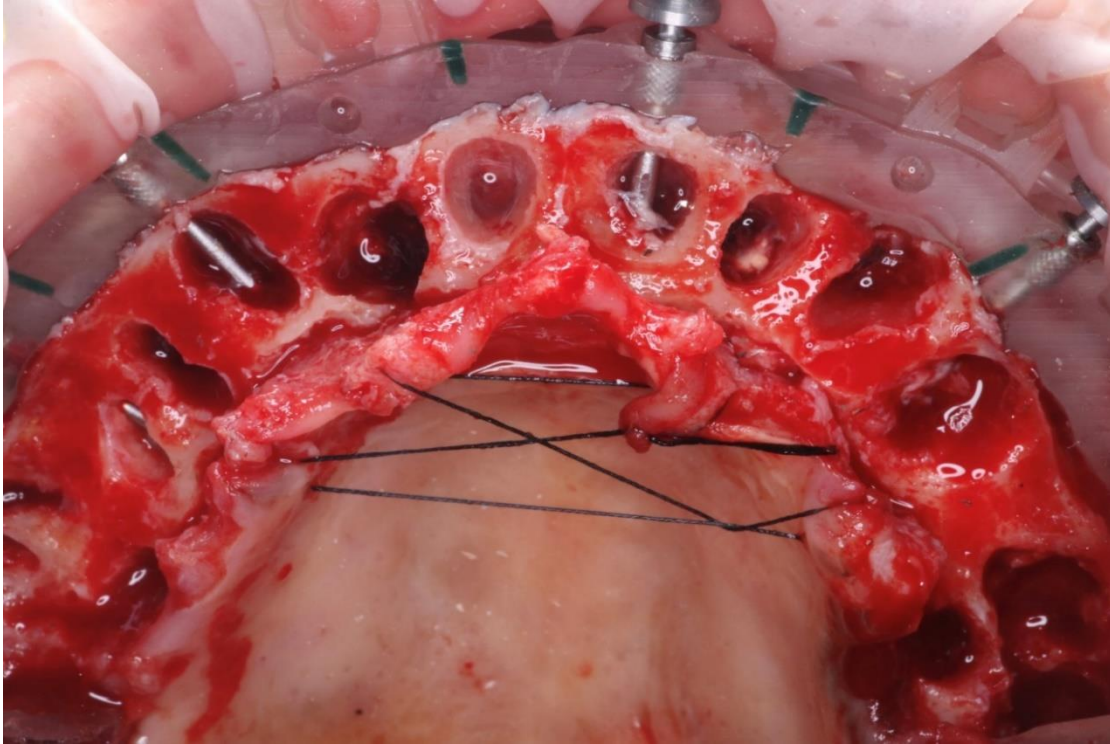
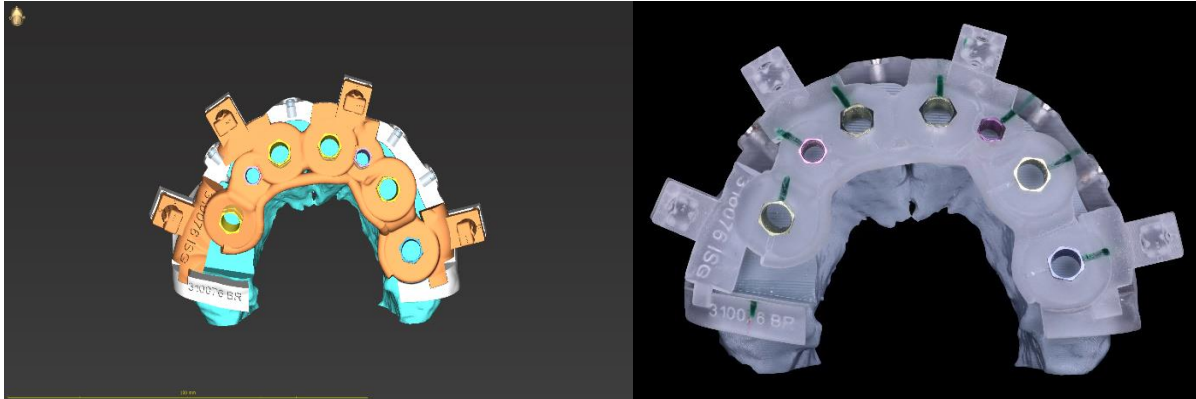


Figure 7: Atraumatic extraction of remaining teeth, reflected flap, and bone level guide secured with retention pins.

Once the required bone leveling was accomplished with the surgical handpiece, the stackable implant surgical guide was locked in place above the bone leveling guide, and the sites for the implants were initiated with designated drills and their appropriate keys from Hahn Guided Kit (Figures 8, 9 and 10) utilizing the Aseptico® surgical handpiece and surgical motor (AEU 7000) at a speed of 1200 rpm with copious amounts of sterile saline. Sequential osteotomy formers and keys from the Hahn Guided Surgery Kit were then used to shape the final osteotomies. Once the osteotomies were complete, a rotary implant driver was used to place the dental implants until increased torque was necessary (Figure 7). The ratchet wrench was then used to torque the implants to final depths reaching a torque level of about 40-50Ncm. After the implants have reached their full depth, a PRF (Emerginova) was used to graft any exposed areas from the implant sites. Next, the implant surgical guide was replaced by the abutment guide (figures 8 and 9), which also locks into place on top of the bone leveling guide, to ensure that the multi-unit abutments are being placed in the correct orientation and angulation as planned.



Figures 8 and 9: Digital design of the implant surgical guide

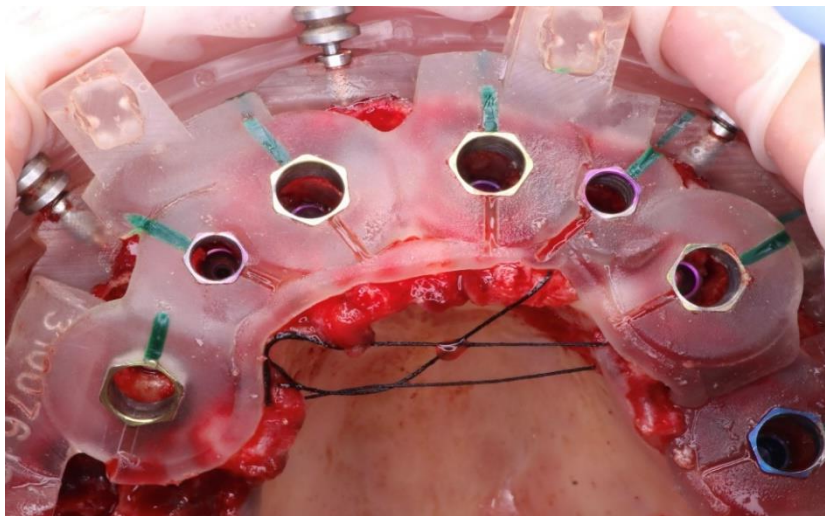


Figure 10: 3DDX implant surgical guide with Hahn sleeves placed on top of the bone reduction guide

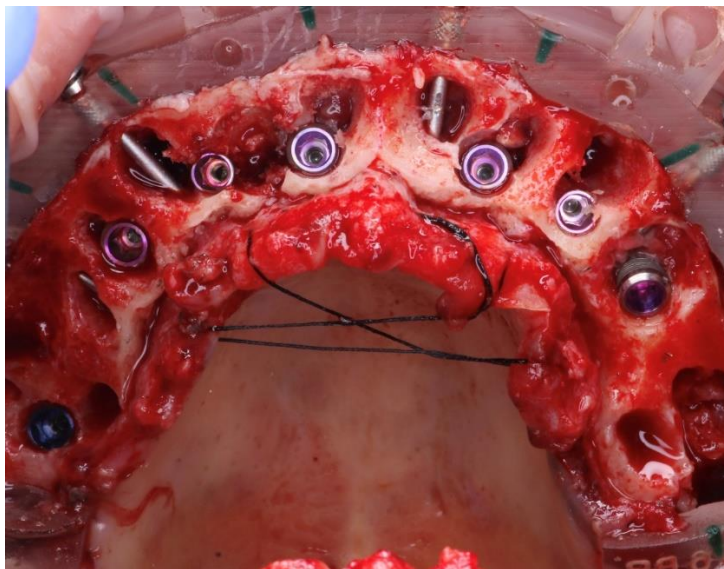
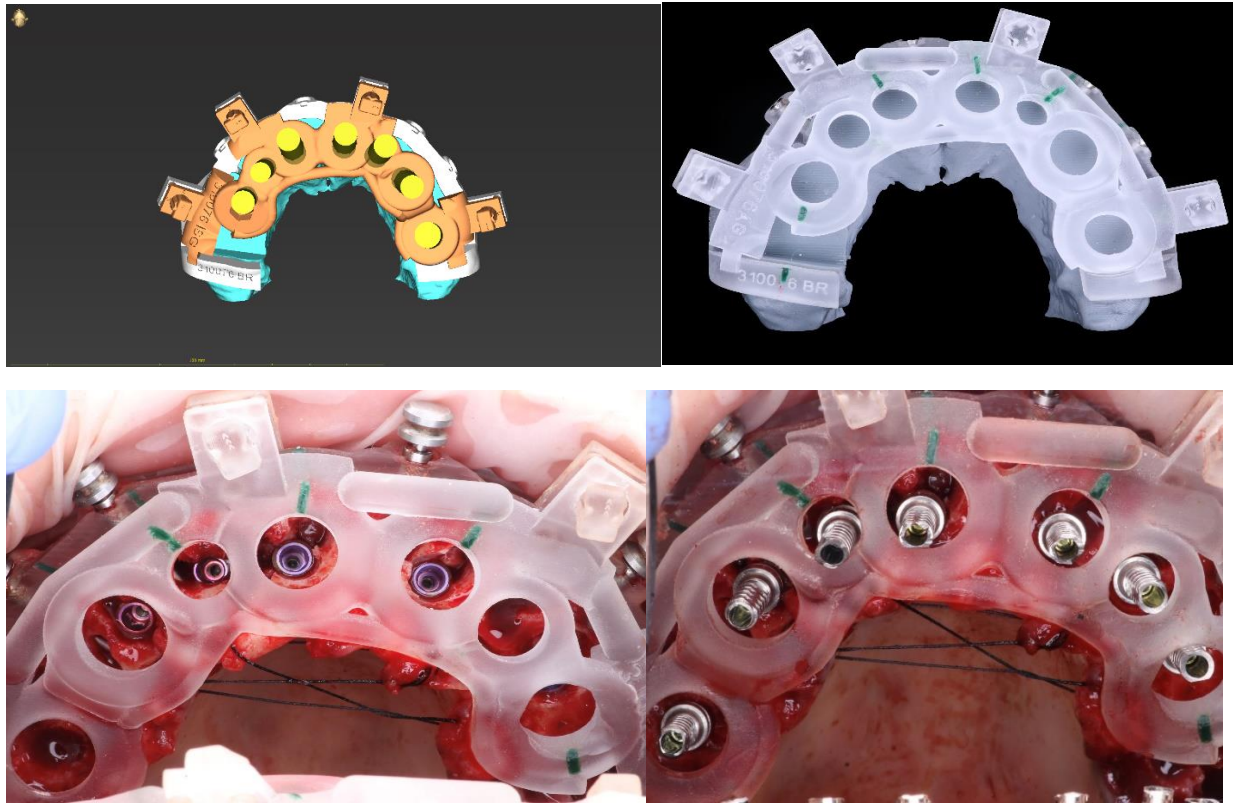
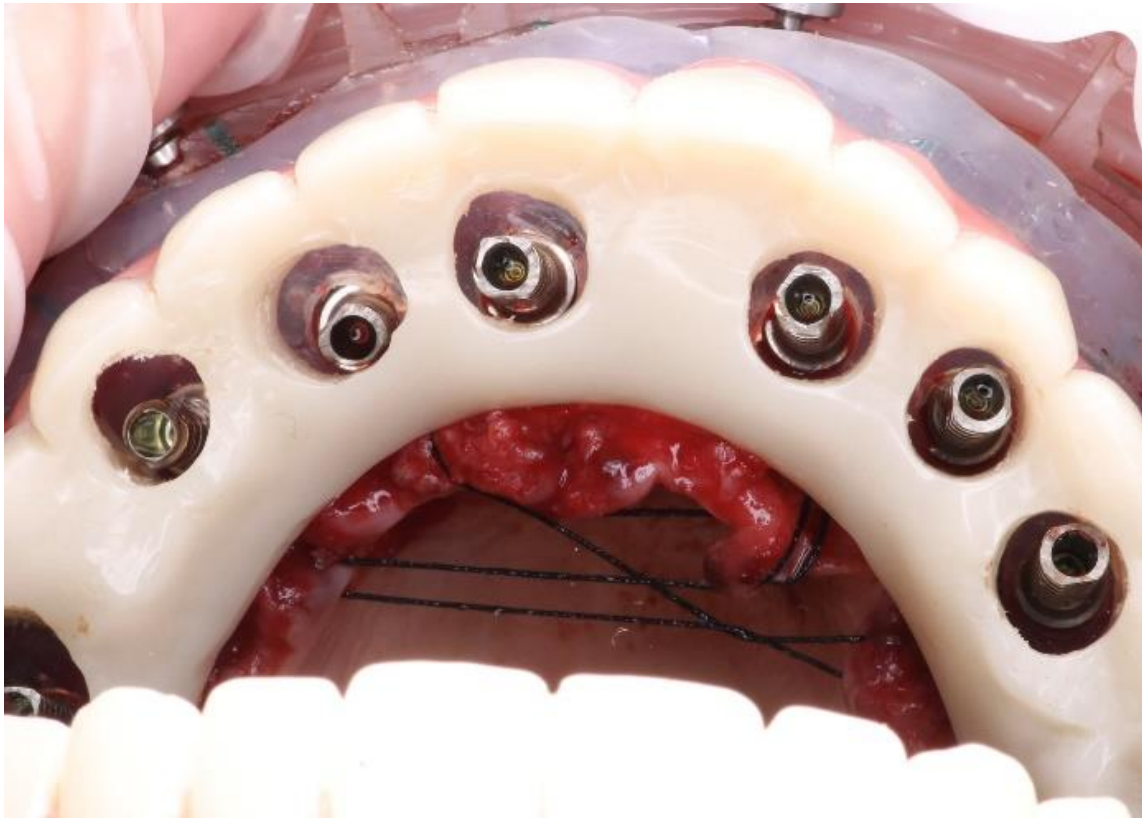
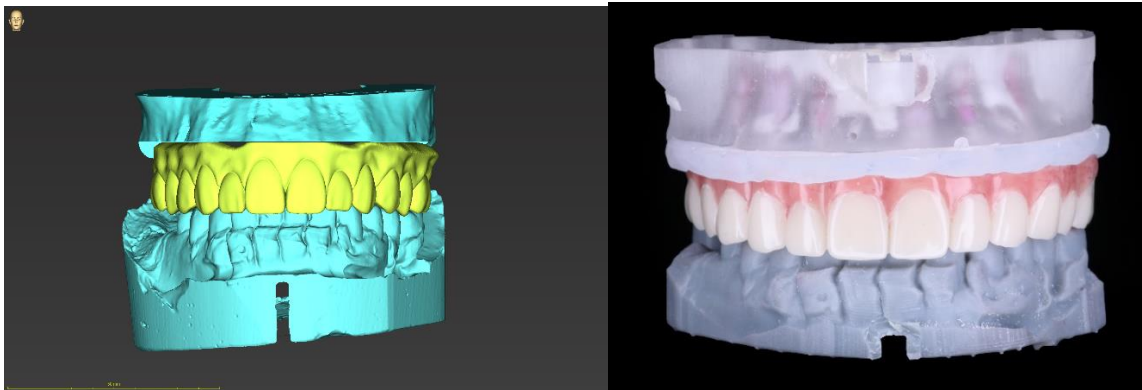


Figure 11: Implants placed to their final depths through 3DDX Implant Surgical Guide



Figures 12-14: Digital design of the abutment guide, along with the 3DDX Abutment guide being placed for inspection and placed clinically, with multi-unit abutments adjusted into correct orientation.

The 3DDX-prefabricated immediate provisional hybrid restoration with pre-drilled access openings was inspected before being tried in (Figures 15-17). The maxillary provisional restoration was tried in to verify a passive fit over the temporary abutments. Once confirmed, the provided custom-made polyvinyl siloxane gasket was placed to prevent the restoration (Figures 15-17) from locking on during the pickup procedure. Pickup material (Zest Chairside) was injected into pre-made access holes in the hybrid restoration. After the material polymerized, the immediate provisional restoration was removed and any excess material removed with the Torque Plus (Aseptico) lab handpiece and acrylic bur. The restoration was then finished and finalized inside the patient's oral cavity, enabling the patient to leave the office with a brand new smile.(Figures 18 and 19)



Figures 15, 16 and 17: Digital design and fit of the hybrid restoration, clinical try in and relining of the maxillary provisional.



Figures 18 and 19: Finished maxillary restoration and final result.



Figure 20: Patient before and after photos

Conclusion

Having the ability to take a patient from start to finish with fewer appointments allows you to position yourself as a provider that can safely fulfill your patients' surgical and restorative needs, especially during these crucial times. The Guided Surgery workflow allows you to reduce the number of visits for the patient and, most importantly, enables the dental provider full control of the surgical and prosthetic outcome, along with the reduced risk of spreading the virus between all stakeholders. In this case, the patient was provided with a new smile after in a single surgical visit at Kirkland Premier Dentistry, and in collaboration with 3DDX. In addition to taking all the necessary infection control measures before, during and after the surgery, the results are nothing short from life-altering.