The Utilization of an End-to-end Digital Workflow to Maximize Full Mouth Rehabilitation Success using Magnetix™ Guides

Case by Dr. Curry Leavitt

Introduction:

Digital technology has become widely used in the execution of full mouth reconstruction cases. The advent of digital workflows has been found to improve diagnosis, case planning, and surgical execution of these cases, all of which led to safer, more accurate, and more predictable clinical outcomes.

In this case study, we demonstrate how the use of guided surgery techniques can contribute to the overall success of complex full-mouth rehabilitation cases by making them faster, shorter, safer, and ultimately more predictable.

Case Presentation and Administration

A 56-year-old female presented to the dental clinic complaining of looseness in her upper teeth, tooth sensitivity and difficulty biting. Clinical examination revealed the patient had gingivitis, gingival recession in the upper right lateral incisor and the upper left central incisor. (Figure 1). Radiographic examination showed the patient had bone recession in the upper incisors, specifically around the upper right lateral incisor and canine (Figure 1).

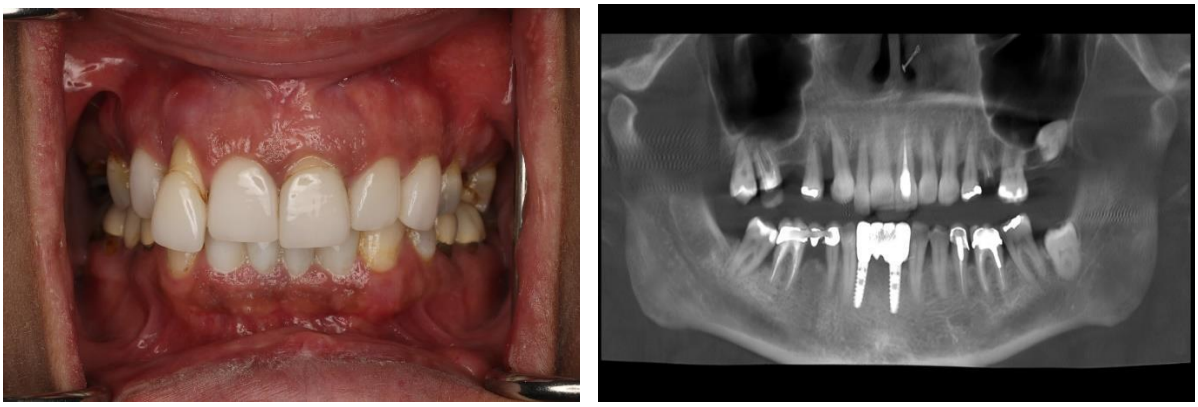

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Figure 1: Preoperative clinical picture (A) showing swollen and receded gums and panoramic image (B) showing bone recession in the anterior maxilla.

Case Planning

To properly plan the treatment for the case, a CBCT scan was taken using the office's Galileos® CBCT machine. Next, implants were planned on the panoramic radiograph by virtually placing them using CoDiagnostix® 3D implant planning software (Figure 2).

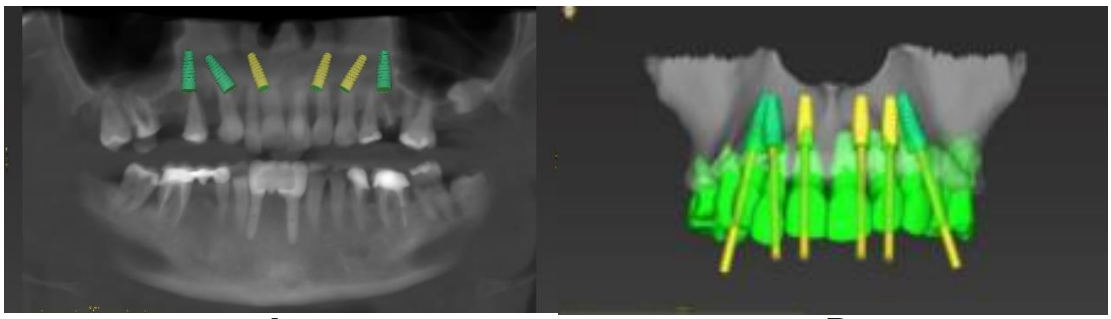

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Figure 2: Preoperative panoramic radiograph with virtual placement of 6 implants (A) and screenshot of implant planning on CoDiagnostix® software (B) for treatment planning purposes.

To further develop a treatment plan, impressions of both arches were taken using a 3Shape intraoral scanner from which digital diagnostic models were formed and digitally mounted on an articulator to help develop a restoration that most accurately mimics the patient's occlusion.

Clinical photos of the patient and the digital diagnostic models were integrated to form a final 3D virtual treatment plan with the assistance of 3DDX dentists. An online fine-tuning session was scheduled with a 3DDX dentist to review and approve the proposed treatment plan and ensure it would fulfill the esthetic and functional needs of the patient (Figure 3).

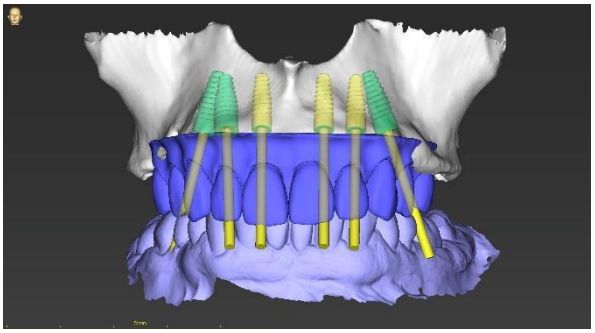

Figure 3: Screenshot of the final virtual treatment plan in occlusion with articulated mandibular models.

This case was planned with BioHorizons Tapered Pro implants, using the BioHorizons guided surgery kit for fully guided drilling and implant placement, in addition to the 3DDX fixation pins for guide stabilization.

After the implant planning was completed, a 3DDX prosthodontist proceeded with the digital design of the guided full mouth restoration (GFMR). The GFMR is composed of the Magnetix™ pin positioning guide (PPG), the bone reduction guide (BRG), the implant surgical guide, and finally the temporary

restoration. The guide components stack on top of each other via magnets fitted in the BRG, which is what distinguishes the Magnetix™ guide from conventional guides and allows for maximum retention between guide components. After review and approval of their digital design, the GFMR components were manufactured and delivered to the dental office before the day of the surgery along with a detailed printout of the surgical plan for the case.

Implant Surgery

After planning and digitally designing the treatment plan for this case, an appointment was scheduled with the patient for performing the surgery(Figure 4). The patient was anesthetized using local anesthesia and IV sedation. First, the pin-positioning guide was seated over existing teeth to help mark where the BRG should be seated to ensure accurate implant placement. A full-arch flap was reflected, and selective extraction of some of the maxillary teeth and remaining roots was performed (Figure 5). The BRG and the Magnetix™ PPG were assembled together and placed on the remaining maxillary teeth to aid in drilling and placing the fixation pins through the same guide (Figure 6). The Magnetix™ PPG was then removed and atraumatic extraction of all remaining teeth was performed. Then the bone was leveled using a large bur attached to a straight surgical handpiece guided by the BRG (Figure 7).

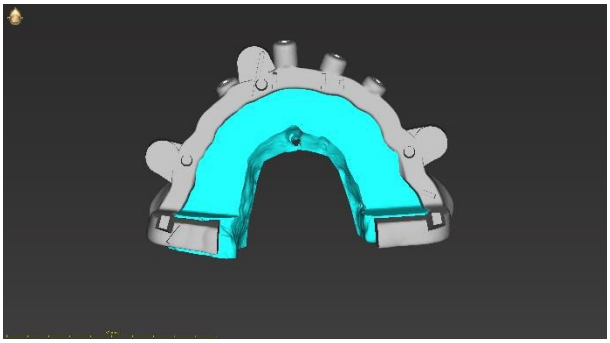

Figure 4: Screenshot from CoDiagnostix® software showing the digital design of the bone reduction guide (BRG).

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Figure 5: Clinical picture showing reflection of the flap (A) and extraction of the maxillary teeth(B).

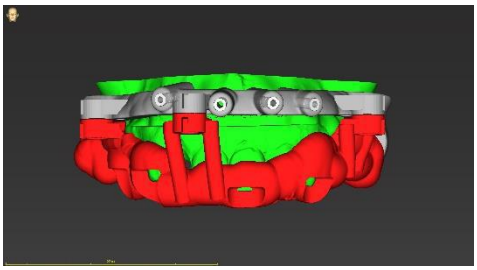

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Figure 6: Screenshot from CoDiagnostix® software (A) and clinical picture (B) showing the Magnetix™ PPG and BRG.

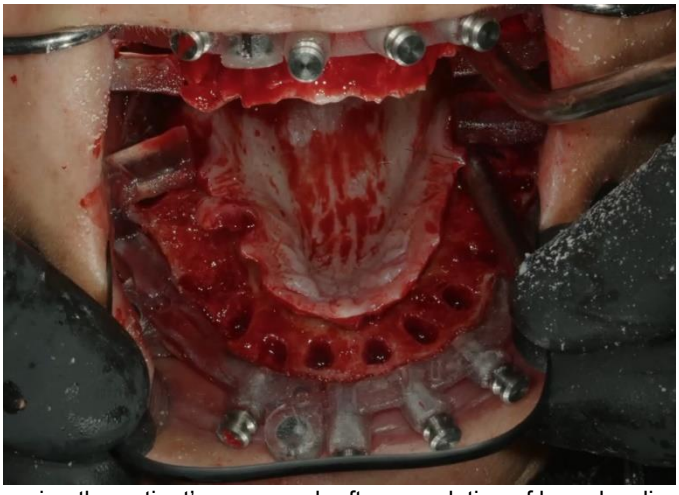

Figure 7: Clinical picture showing the patient's upper arch after completion of bone leveling under the guidance of the BRG.

After bone reduction was completed, the implant surgical guide was then snapped into place on top of the BRG (Figure 8).

After placement of the implant surgical guide, BioHorizons® surgical kit was used to initiate the implant sites with the designated drills, and then final osteotomies were shaped using sequential drilling (Figure 9).

Following drilling, BioHorizons® Tapered Pro implants were placed into the

formed osteotomies until increased torque was necessary (Figure 10). The ratchet wrench was then used to torque the implants to their final depths (Figure 11).

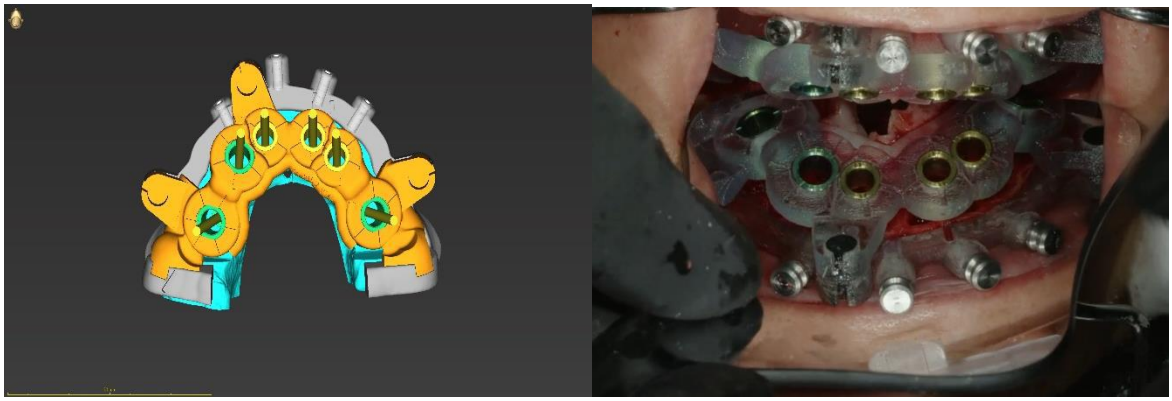

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Figure 8: Screenshot from CoDiagnostix® software of the digitally designed implant surgical guide (A) and a clinical picture of its placement on top of the BRG (B).

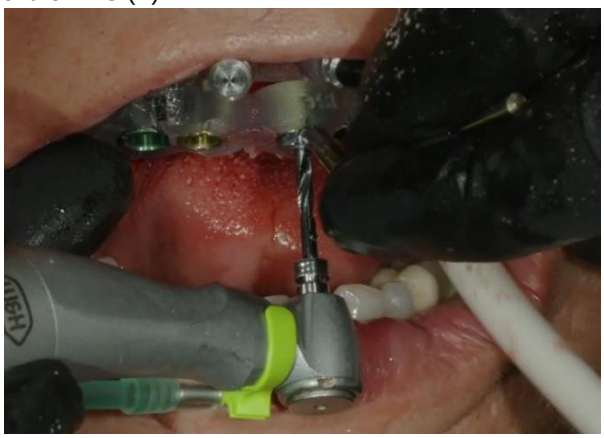

Figure 9: Clinical picture showing drilling of the osteotomies via the implant surgical guide.

Figure 10: Clinical picture showing implant placement into the drilled osteotomies via the implant surgical guide.

Figure 11: Clinical picture showing the placed implants at their final depths.

After implant placement was completed, the implant surgical guide was removed and the multi-unit abutments (MUA) were placed into the planned position and angulation. To ensure correct orientation of the abutments, orientation indicator markers on the BRG are aligned with the screw-access holes of the angled MUAs (Figure 12).

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Figure 12: Clinical picture showing the placement of the abutment (A) and the verification of parallelism between all of the abutments placed via orientation indicator slots (B).

After the alignment of the MUAs was verified, pre-cut temporary cylinders were screwed on them for the pickup procedure (Figure 13), after which a temporary polymethyl methacrylate (PMMA) restoration designed and fabricated by 3DDX prosthodontists was to be placed (Figure 14).

The PMMA restoration, which contained pre-drilled access openings, was tried in to verify a passive fit over the abutments (Figure 15). Once the restoration's fit was confirmed, pickup material was injected into the access holes on the palatal

surface of the PMMA restoration and cured until polymerization and hardening of the material occurred (Figure 16). The PMMA restoration was then removed (Figure 17), and any excess material was removed with a lab handpiece and acrylic bur, including the arms on the PMMA restoration initially used to help with its seating on the BRG. Smoothening of any sharp bony edges preventing proper seating of the restoration was performed using a surgical bur and was followed by suturing of the flap tissue (Figure 18). Healing caps were then placed on the MUAs to keep their margins intact and prevent soft tissue from covering them (Figure 19).

Figure 13: Clinical picture showing the placement of pre-cut temporary cylinders on the MUAs.

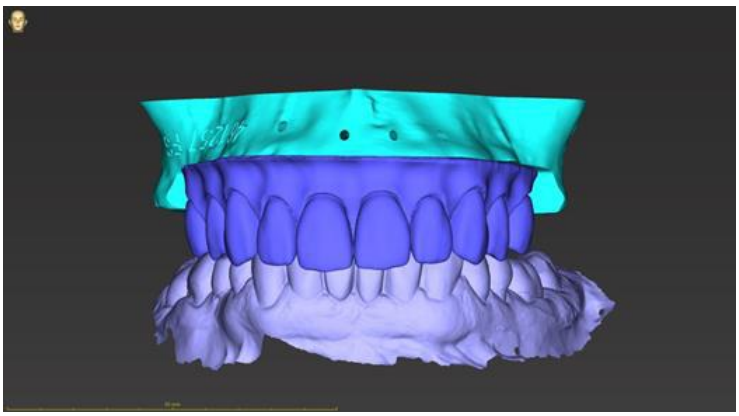

Figure 14: Screenshot from CoDiagnostix® software showing the digital design of the PMMA restoration.

Figure 15: Clinical picture showing the try-in of the PMMA restoration.

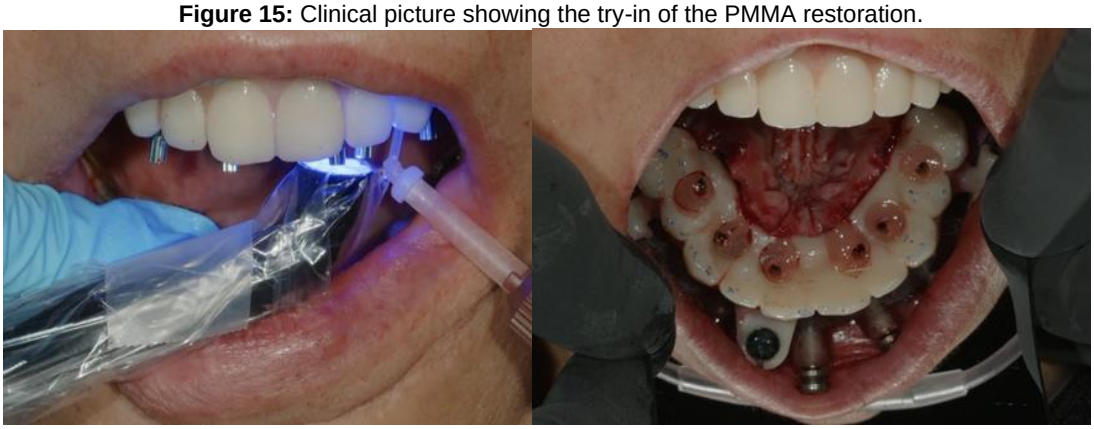

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Figure 16: Clinical picture showing the light curing of the pickup material (A) and the red pickup material surrounding the copings after hardening (B).

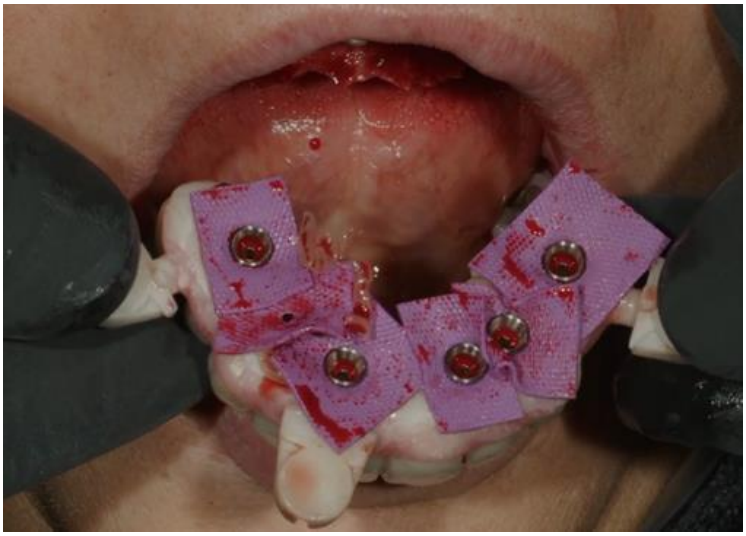

Figure 17: Clinical picture showing the PMMA restoration removed from the oral cavity after the pickup process.

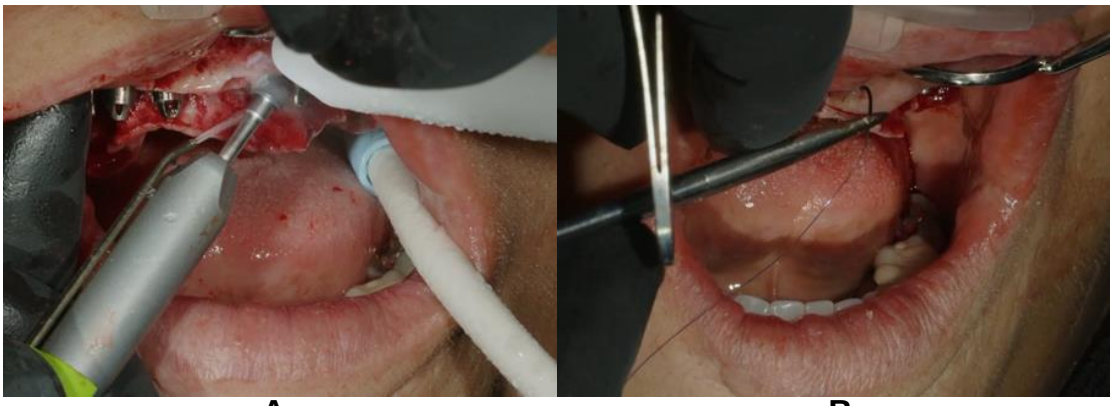

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Figure 18: Clinical picture showing the smoothening of bony edges (A) and subsequent tissue suturing (B).

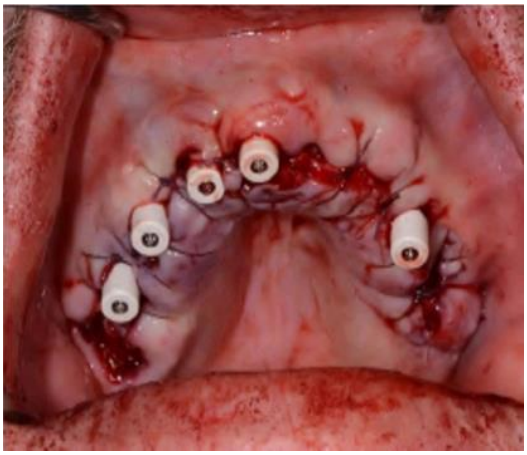

Figure 19: Clinical picture from a previous case showing the appearance of the healing caps placed on the MUAs.

The restoration was then finished, polished, and seated in the patient's oral cavity (Figure 20). The access holes on the palatal surface were filled with a rubber material to prevent food entry (Figure 21). The workflow for this case was entirely digital, and the full procedure was completed in a single visit, enabling the patient to leave the clinic that day with a complete transformation in her smile (Figure 22).

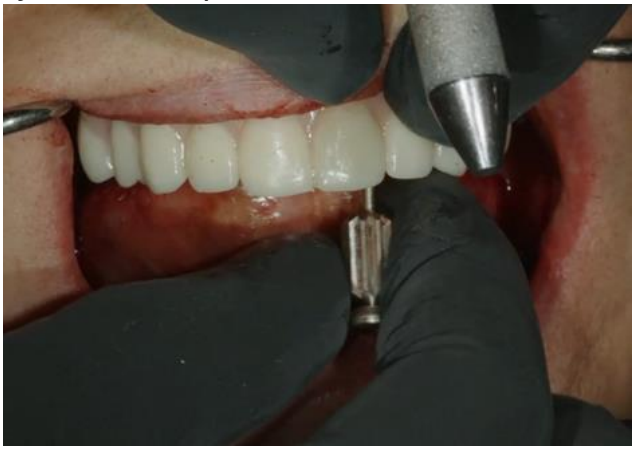

Figure 20: Clinical picture showing the seating of the temporary restoration.

Figure 21: Clinical picture showing access holes in the palatal surface of the restoration filled with rubber material (orange) to prevent food entry.

Figure 22: Clinical picture showing the finished temporary restoration seated in the patient's mouth.

Conclusion

The utilization of digital workflows for dentistry has increased the accuracy and improved diagnosis, treatment planning and surgical execution in guided full mouth rehabilitation (GFMR) cases.

Above all, the workflow allows the practitioner to drastically reduce the number of patient visits, enabling him/her to complete the entire case in just a single visit. This not only saves time for both patient and practitioner, but also provides the patient with a complete smile transformation in just one visit.