The Immediacy and Accuracy of Guided Full Arch Rehabilitation Using MagnetiX™ Surgical Guides

By Dr. Curry Leavitt,DMD

In the world of modern dentistry, innovations continually shape the landscape, offering patients procedures that prioritize precision, efficacy and comfort. One such advancement that is gaining traction among dentists and patients alike is guided surgery, specifically guided full mouth rehabilitation (GFMR).

The ability to immediately place implants for maximum esthetics and the accuracy of implant placement using digital treatment planning of implant position (leading to shorter treatment time and reduced risk of surgical complications) is the reason why guided surgery has revolutionized dental implantology.

This case study shows how guided surgical and prosthetic planning can work hand in hand to result in immediate, highly accurate, esthetic and functional restoration of full arch cases.

Case Presentation and Administration

A 76-year-old male patient presented to the dental clinic complaining of the unsightly appearance of his upper teeth and the inability to properly bite food. Upon clinical examination, the patient showed generalized caries with fractured, non-restorable maxillary incisors, canines, premolars and molars (Figure 1A, 1B).

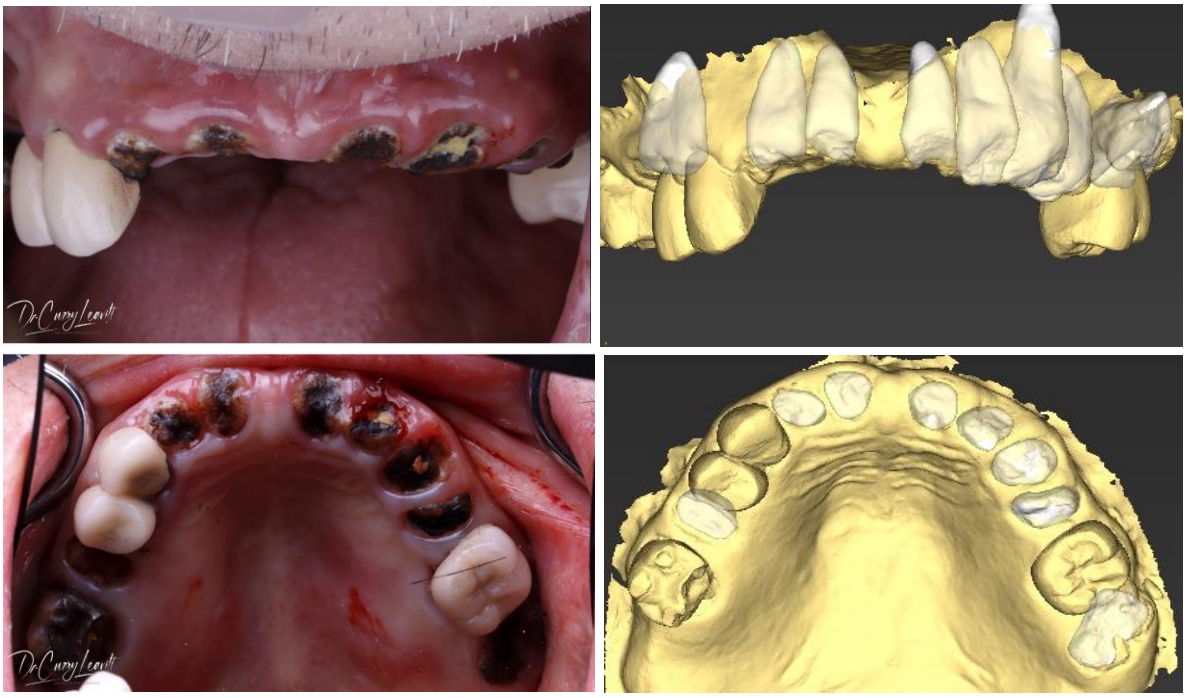

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Figure 1: Clinical pictures in facial and occlusal views revealing carious maxillary incisors, canines, premolars and molars (A) and preoperative treatment planning screenshots of the same (B).

Case Planning

To properly plan the treatment for the case, a CBCT scan was taken using the office's Planmeca® CBCT machine and sent to 3DDX. Treatment planning was performed by 3DDX using coDiagnostix® implant planning software to plan the implants into their ideal positions in the upper arch (Figure 2).

Figure 2: Screenshot of implant planning using CoDiagnostix ® software on the preoperative radiograph during the treatment planning stage.

To further develop a treatment plan, the treatment planning team at 3DDX took impressions of both arches using an intraoral scanner. From these impressions, digital diagnostic models were formed and digitally mounted on an articulator. The digital models integrated with the preoperative clinical photographs taken during the consultation visit were used for digital smile design and accurate prosthetic planning of the restoration. Parameters such as lip support, transition line, restorative space, implant number, and implant position were taken into consideration to help develop a facially driven, prosthetically derived full arch restoration customized to the patient's face.

After a treatment plan was developed, 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.

Once 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 (ISG), 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

Upon receiving the GFMR components and surgical plan, an appointment was scheduled with the patient for performing the surgery.

The patient was first anesthetized using local anesthesia and IV sedation. A full-arch flap was reflected, and selective extraction of the carious and fractured teeth/remaining roots was performed (Figure 3A, 3B).

Next, the components of the MagnetiX surgical guides were placed in sequential order on the maxillary arch, starting first with the PPG, which was seated over the existing teeth to help mark where the BRG should be seated to ensure accurate implant placement.

The BRG and the 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 4A, 4B). The MagnetiX PPG was then removed, and any remaining teeth were atraumatically extracted (Figure 5A, 5B). Using the BRG, bone reduction was then performed to reach the desired bone level (Figure 6A, 6B).

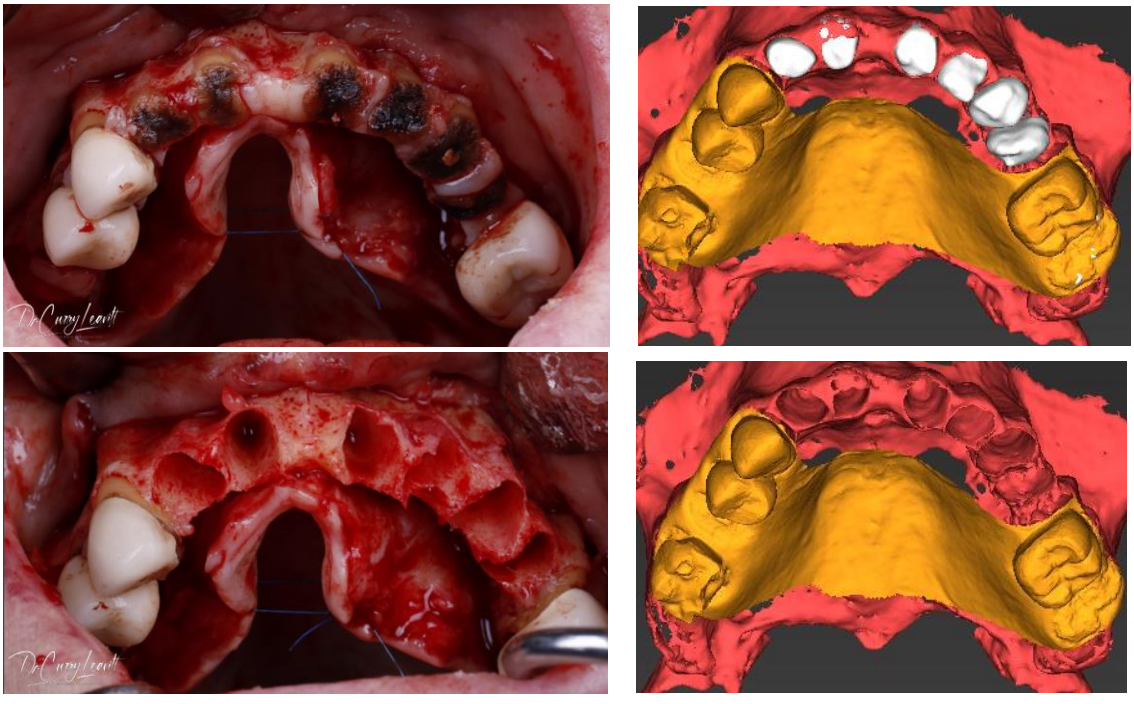

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Figure 3: Clinical picture showing reflection of a full arch flap in the maxillary arch and subsequent extraction of carious teeth/remaining roots (A) and treatment planning screenshots of the same (B).

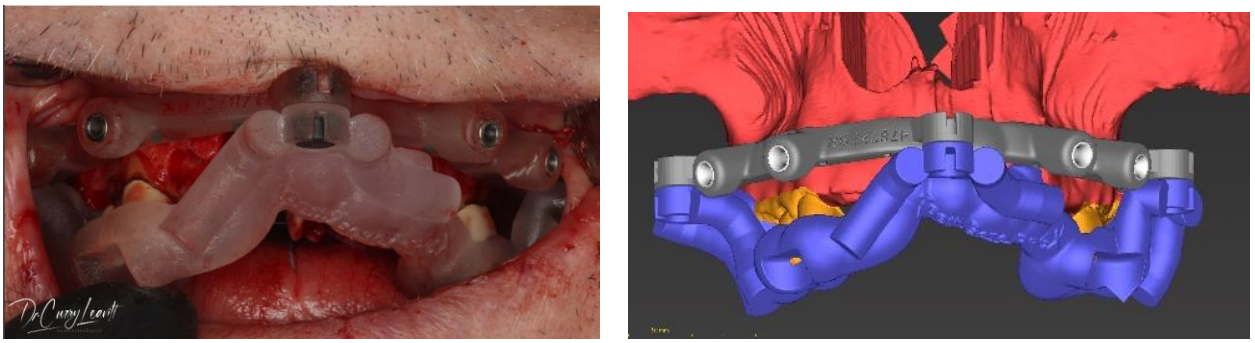

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Figure 4: Clinical picture (A) and planning screenshot (B) of the PPG and BRG on the remaining maxillary teeth.

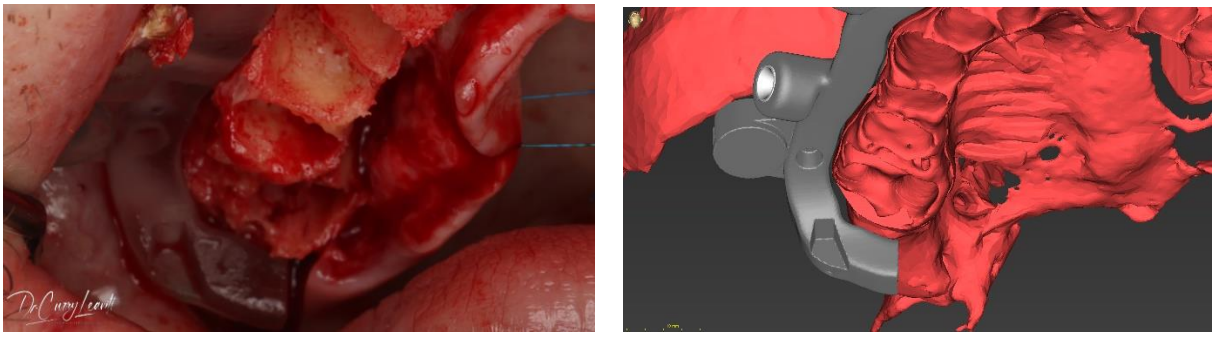

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Figure 5: Clinical picture (A) and planning screenshot (B) showing extraction of the remaining maxillary teeth.

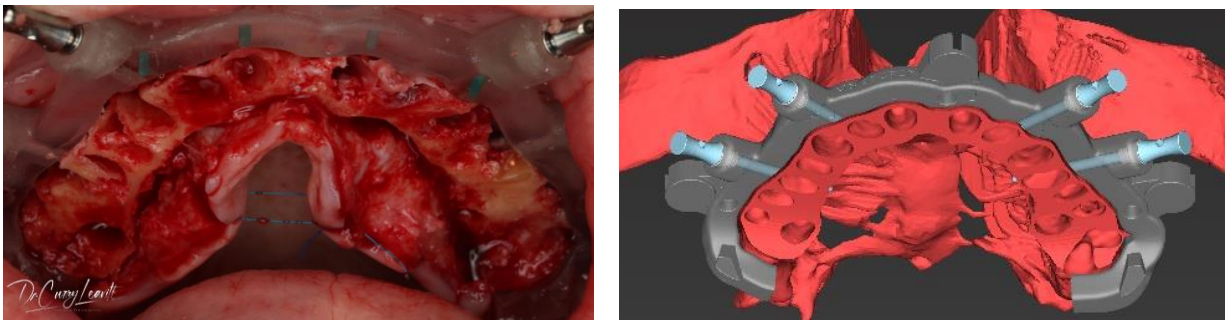

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Figure 6: Clinical picture (A) and planning screenshot (B) showing the BRG after bone reduction.

Following bone reduction, the jaw was now prepared to receive the implants. The ISG was seated on top of the BRG to begin drilling of the implants into the planned position and hex orientation (Figure 7A, 7B).

An “All-on-6” approach was used to restore the arch, wherein 6 implants were placed in the position of teeth numbers 3, 6, 8, 9, 11, and 14.

After placement of the ISG, the BioHorizons® CGS guided surgical kit was used to initiate the digitally derived implant sites with the designated drills, and then the final osteotomies were shaped by sequential drilling (Figure 8).

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

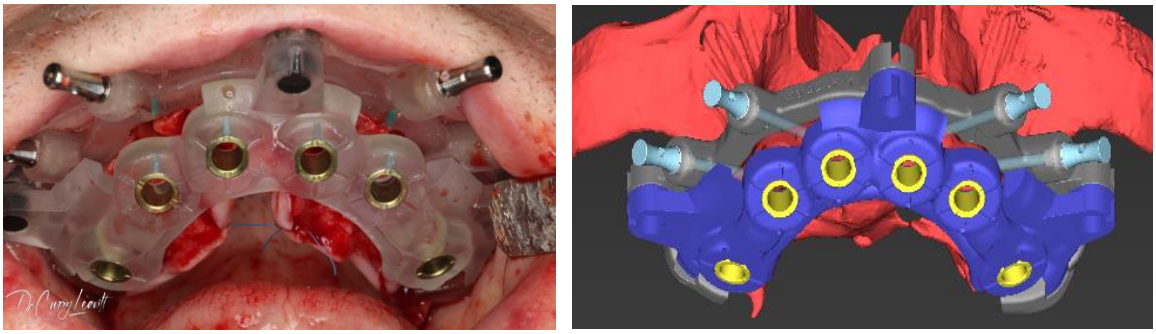

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Figure 7: Clinical picture (A) and planning screenshot (B) showing the ISG seated on the BRG.

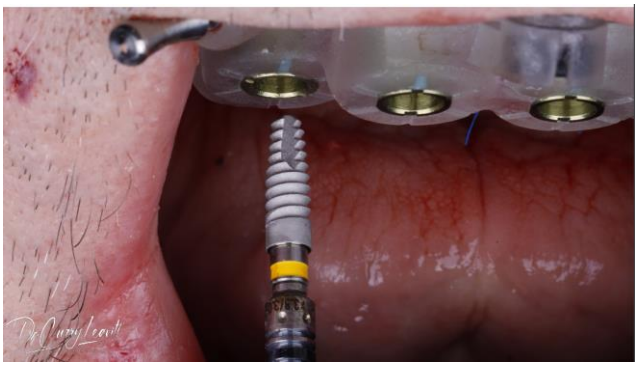

Figure 8: Placement of implants into the drilled osteotomy sites using the ISG for guidance.

Following implant placement, the ISG was removed. The multi-unit abutments (MUA) were then prepared to be placed into the planned position and angulation (Figure 9). The accuracy of the abutment lineup was ensured via the orientation indicator markers on the BRG which were aligned with the screw-access holes of the angled MUAs to ensure their correct orientation (Figure 10A, 10B).

Figure 9: Restorative components including the abutments, titanium cylinders and rubber dam for each of the 6 implants to be placed.

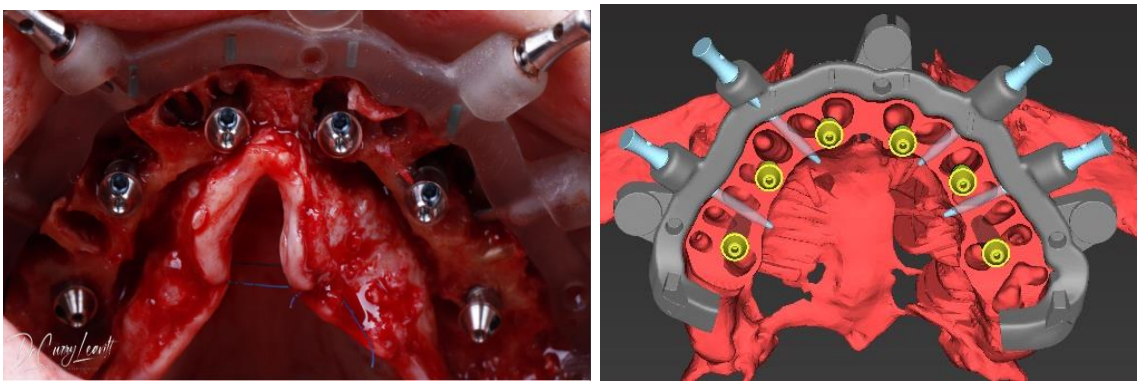

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Figure 10: Clinical picture (A) and planning screenshot (B) showing placement of the abutments using the orientation indicator markers on the BRG for guidance.

After placement of abutments, the pickup procedure was carried out, which basically featured screwing pre-cut temporary cylinders onto the abutments followed by placement of a temporary polymethyl methacrylate (PMMA) restoration designed and fabricated by 3DDX prosthodontists.

The PMMA restoration was first tried in to verify a passive fit over the abutments (Figure 11A, 11B). Upon verification of restoration fit, pickup material was then injected into the access holes on the palatal surface of the PMMA restoration and cured until polymerization and hardening of the material (Figure 12A, 12B).

The PMMA restoration was then removed from the patient's mouth, and grafting was done for bone defects and sockets (Figure 13A), filling them with bone graft material (Figure 13B) and covering with a barrier membrane before suture (Figure 13C). The flap tissue was sutured with healing caps placed on the

MUAs to improve the structure and support of the soft tissue contours (Figure 14).

While the grafting procedure was underway, the PMMA was finished in-house using a lab handpiece and acrylic bur. This included removing the arms on the PMMA restoration initially used to help with its seating on the BRG. The PMMA was handcrafted by 3DDX prosthodontists. The customization of hue, translucency, tooth shape and surface texture resulted in a personalized restoration tailored specifically for the patient's face (Figure 15).

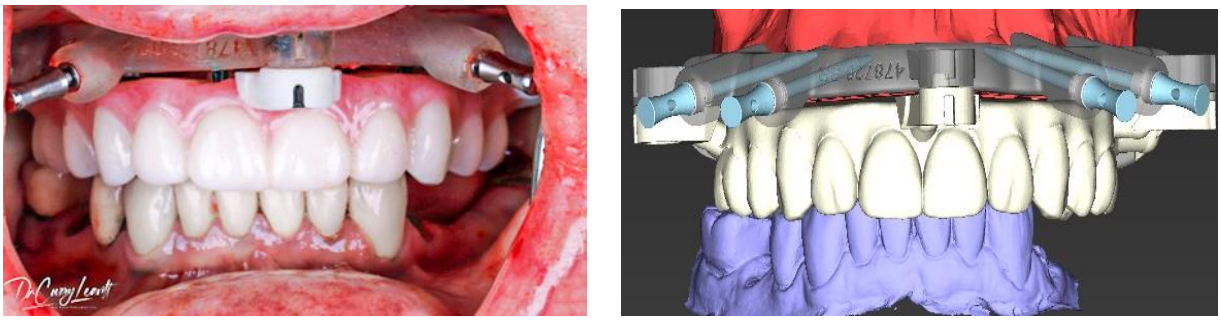

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Figure 11: Clinical picture showing temporary restoration try-in to ensure passive fit (A) and its digital design (B).

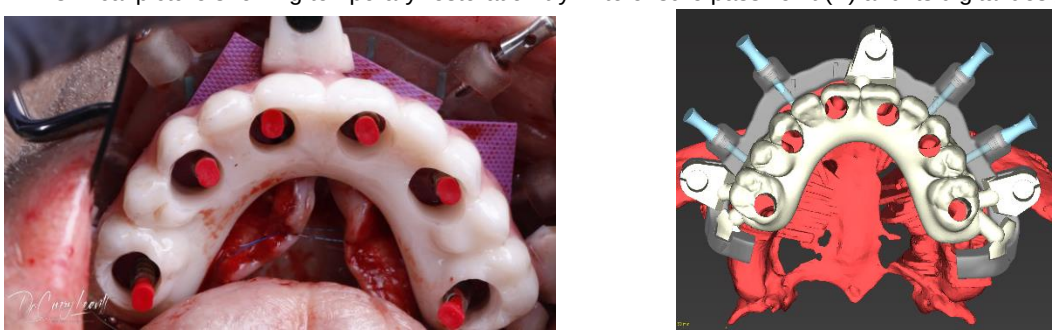

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Figure 12: Clinical picture of injection of pickup material into the access holes on the palatal surface of the PMMA (A) and planning shot of PMMA over the PPG (B).

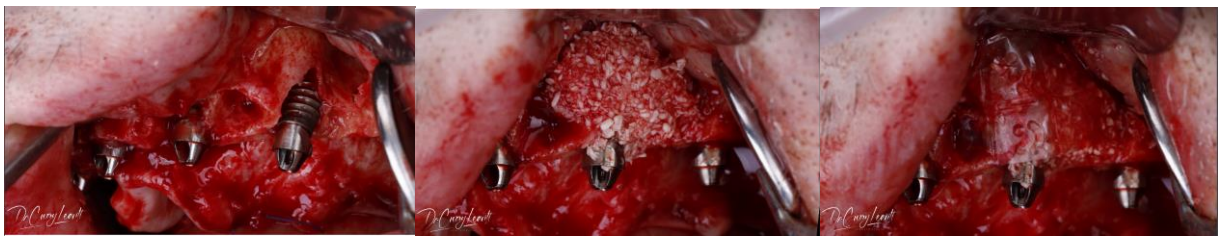

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Figure 13: Bone defect surrounding the implant (A) was filled with bone graft material (B) and covered with a barrier membrane (C) before suturing the flap.

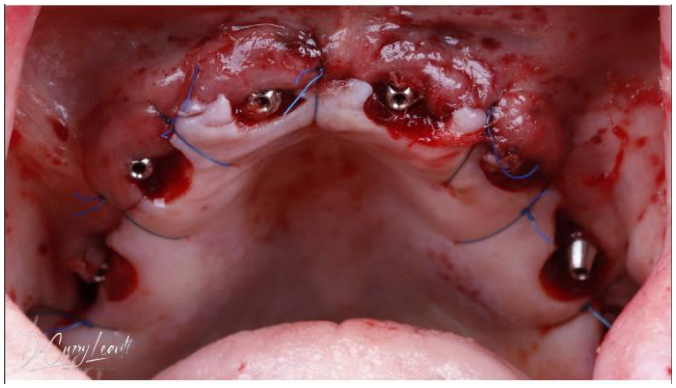

Figure 14: The sutured flap tissue with healing caps over the abutments

Figure 15: Temporary PMMA after finishing ready for seating in the patient mouth.

The finished temporary restoration was subsequently seated in the patient's oral cavity (Figure 16). The access holes on the palatal surface were filled with a rubber material to prevent food entry (Figure 17). Bite paper was used to adjust the occlusion. Very minor adjustments were made thanks to the accuracy of the guided surgery and prosthetic planning.

The full procedure from start to finish was completed in a single visit within a maximum of 90 minutes, enabling the patient to leave the clinic with a brand-new full set of teeth and an unforgettable smile (Figure 18, 19, 20).

Figure 16: Seating of finished temporary restoration in the patient's mouth.

Figure 17: Clinical picture showing access holes in the palatal surface of the restoration filled with rubber material to prevent food entry.

Figure 18: Postoperative photo of the patient with a full set of teeth and an unforgettable smile

Figure 19: Extraoral preoperative and postoperative photos of the patient.

Figure 20: Intraoral pre and postoperative photos of the patient