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Revolutionizing Full Arch Implant Reconstruction: The Role of Guided Surgery and Photogrammetry in All on X Success

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ABSTRACT

This case report details the successful implementation of full arch guided implant surgery utilizing photogrammetry [1] for digital conversion in a patient with edentulous maxilla. The integration of advanced digital technologies improved surgical precision, reduced chair time, and enhanced patient outcomes.

Keywords

Full arch implant reconstruction, Guided surgery, Photogrammetry, Digital dentistry, Digital workflow, Digital conversion, Case report.

Introduction

Full arch rehabilitation with implants has become a common solution for edentulous patients, providing improved function and aesthetics. The advent of guided surgery [2] and digital technologies, such as photogrammetry, has further refined the implant placement process, allowing for enhanced precision and predictability. This report outlines the case of a 68-year-old female patient who underwent full arch implant placement using a guided surgical protocol supported by photogrammetric data acquisition.

Case Report

A 68-year-old female patient presented with a completely edentulous maxilla, and a history of bone resorption. The patient expressed a desire for fixed prosthetic solutions to restore function and aesthetics. Clinical examination and radiographic evaluation indicated that the patient is a candidate for a full arch implant-supported fixed restoration.

Materials and Methods

Initial Evaluation

Comprehensive dental examination was performed and medical history reviewed. CBCT (Cone Beam Computed Tomography) imaging was taken to assess bone quality and quantity. Intraoral scans were taken to capture soft tissue contours, existing removable prosthesis, and occlusion. Face scan [3] images were captured to help in planning midline, occlusal plane, transition line, and achieve facially driven aesthetics. Also, set of pictures were taken to assist in the planning process (Figure 1).

Figure 1: Pre-op.

Treatment Planning

A digital workflow [4] was established, integrating the CBCT data with the digital models. A smile design of teeth position and shape was determined. Implant positions were strategically planned using computer-aided design (CAD) software. So, implant position was

based on teeth position, and teeth position and shape were based on face. A facially driven approach starting with the end in mind [5]. A surgical guide was 3D printed based on the planned implant positions, ensuring accurate alignment during surgery.

Surgical Procedure

The patient was treated under local anesthesia. Reference markers [6] were placed in the palate (Figure 2). Full thickness flap was raised to allow access to seat the guide (Figure 3). The surgical guide was secured in place (Figure 4). Minimal bone reduction [7] was performed to allow sufficient restorative space and hide the transition line above the smile line (Figure 5). Implant Surgical guide was seated and fixated in place (Figure 6). Guided implant osteotomy (Figure 7) and guided implant placement (Figure 8) with insertion torque over 45Ncm on all implants was achieved [8]. Total of five implants were placed in the maxilla (Figure 10). Multi-unit abutments [9] were placed utilizing the MUA guide (Figure 11). No grafting was necessary (Figure 12). Flap was adapted back in place and closure was achieved with monofilament absorbable sutures [10].
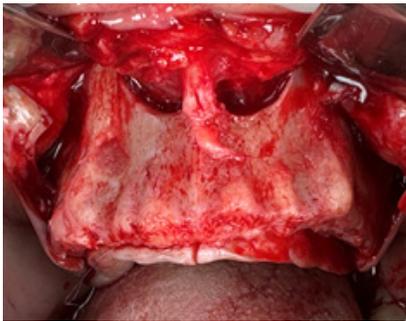

Figure 2: (Pre-Surgery with reference markers).
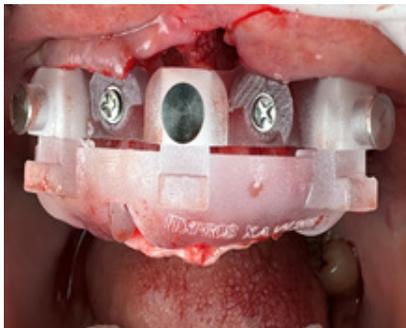

Figure 3: (full thickness flap).
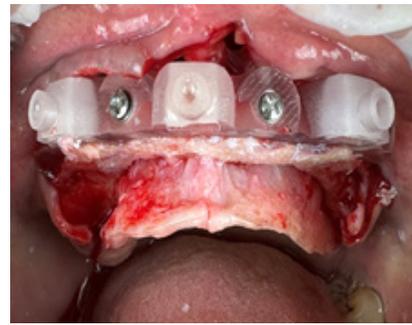

Figure 4: (Surgical guide seated).

Figure 5: (Guided bone reduction).
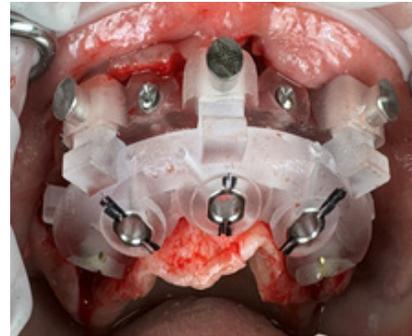

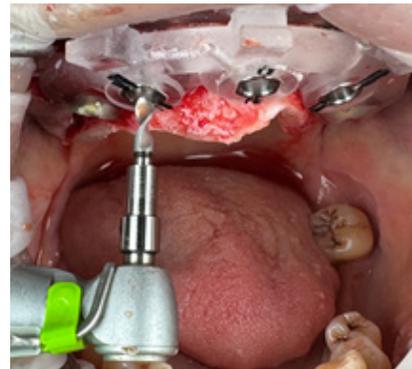**Figure 6:** (Implant Osteotomy Guide).

Figure 7: Implant Osteotomy.

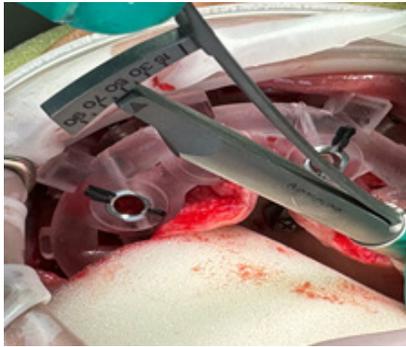**Figure 8:** Guided implant placement.

Figure 9: Insertion torque.
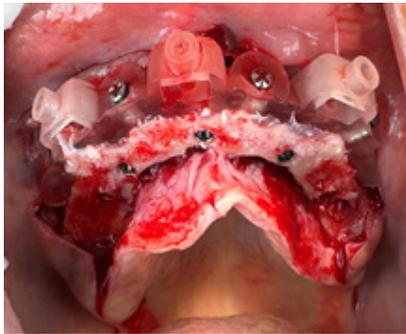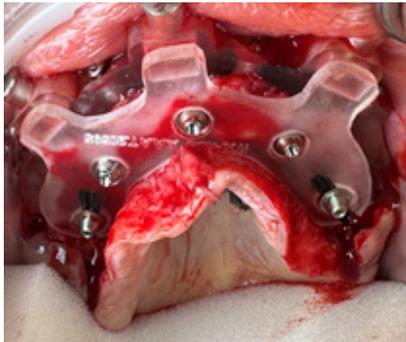

Figure 10: Implants in place.

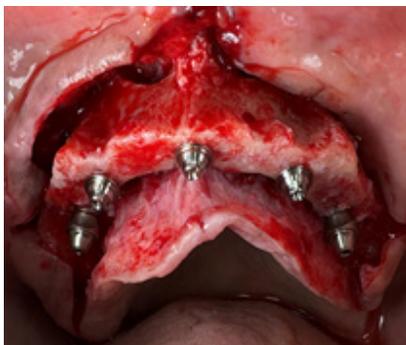**Figure 11:** MUA Guide in place.

Figure 12: MUA's seated.

Digital Conversion

Scan bodies were placed on the MUA's (Figure 13). Digital records were taken utilizing photogrammetry and intra oral scanner (Figure 14) to capture implant position and soft tissue. MUA healing caps were placed (Figure 15). All pre-op post-op digital data was merged to facilitate the design of the provisional prosthesis which then was 3D printed [11], colored, and polished. An interim prosthesis (Figure16-a,16-b) was provided to the patient immediately 24 hours after implant placement [12]. Post op radiograph was taken to confirm seat (Figure 17).
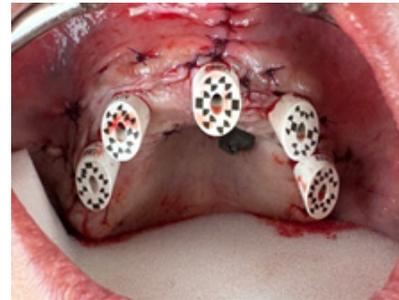

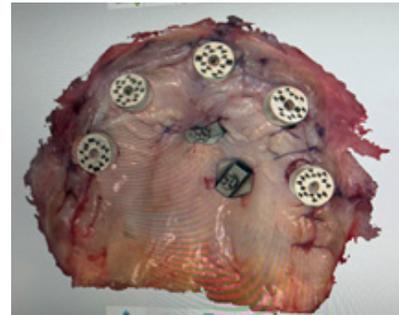**Figure 13:** Scan Bodies for Photogrammetry.
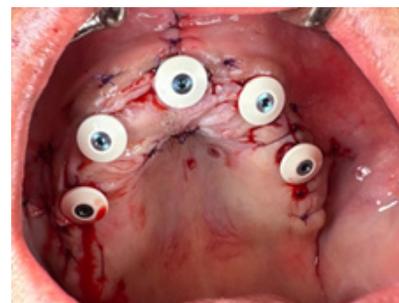

Figure 14: Post surgery soft tissue intra-oral scan.
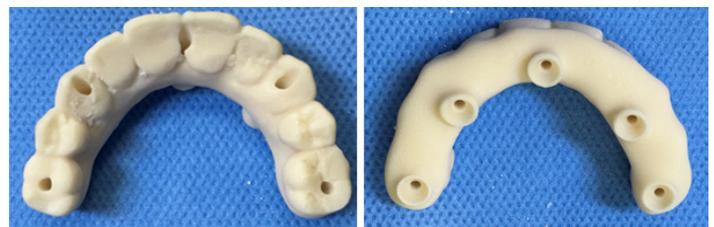

Figure 15: MUA Healiing Caps.

Figure 16: a. Provisional, **b.** Provisional.

Figure 17: X Ray Provisional.

Results

Post-operative assessments showed no complications, with the patient reporting minimal discomfort. Osseointegration was assessed at the 4-month follow-up, digital records (Figure 18) were taken to finalize definitive restoration design. The definitive prosthesis was delivered, achieving optimal function and aesthetic outcomes (Figure 19). Post-op radiograph was taken to confirm seat (Figure 20). The digital workflow facilitated precise implant placement, leading to enhanced patient satisfaction.

Figure 18: Scan bodies in place at stage 2 digital records for definitive prosthesis.

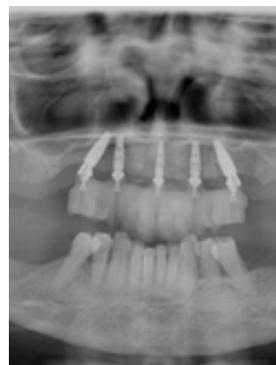**Figure 19:** Definitive Prosthesis.

Figure 20: X Rat Definitive Prosthesis.

Discussion

The integration of photogrammetry in the conversion process of full arch implant reconstruction and utilizing guided implant surgery demonstrates significant advantages in terms of precision and patient experience. This case highlights the effectiveness of combining digital technologies to streamline the treatment process, reducing surgical time and improving outcomes.

This innovative approach not only enhances the precision and efficiency of implant placement but also significantly improves the overall patient experience. As technology continues to evolve, dental professionals are better equipped to deliver successful outcomes, ultimately transforming the lives of patients seeking to restore their smiles with confidence. Embracing these advancements in dental practice is essential for staying at the forefront of modern dentistry.

Conclusion

Full arch guided implant surgery, supported by photogrammetry for digital conversion, represents a significant advancement in dental implantology. This case illustrates the successful application of these technologies, providing a reliable and efficient approach to restoring function and aesthetics in edentulous patients.

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