

Introduction

Full-mouth and **esthetic implant rehabilitation** is **challenging** in partially edentulous patients with prior failing surgical and prosthetic treatments. This clinical case describes an **interdisciplinary, complete digital workflow** combining **guided implant placement, photogrammetry, 3D-milled prototypes**, and **digital smile design** to revive and rehabilitate a very unhappy and low-esteemed patient.

Case Presentation

A **62-year-old male** patient with failing implants, peri-implantitis, failing fixed partial dentures (FPDs) and fractured prostheses presented to our clinic requesting emergency treatment as his entire mouth was failing. (Fig. 1, Fig. 2, Fig. 3, Fig. 4). We discussed various treatment options and agreed to the following **treatment plan**:

The **first phase** of treatment included the use of a **3D** cone-beam computed tomography (**CBCT**) scan, intra-oral scans, **digital smile design** and digital planning software for a **prosthodontically-driven implant plan**. Three maxillary implants and the remaining mandibular teeth (underneath failing FPDs) were planned to be removed with simultaneous GBR and socket preservation.

The **second phase**, 4 months later, involved **3D printing** tissue-supported **surgical guides** (Fig. 5), for the maxillary and mandibular arches, with fixation pins, to place **4 additional implants** in the **maxilla** and **4 additional implants** in the **mandible** as well as delivering a **temporary prosthesis**. (Fig. 6).

The **third phase**, 4 months later, which was the **prosthetic phase**, involved **photogrammetry** technology to digitize the upper arch. **ICam scan-body scans** were performed using Imetric 4D technology to determine the **3D-position of the implants for verification** of the final prosthesis. **Intraoral scans of scan bodies** were made at the new **VDO**, followed by **tissue scans** to digitize maxillary and mandibular implant positions. **CAD/CAM software** was used to fabricate full-arch **PMMA prototypes** for both maxillary and mandibular arches. (Fig. 7, Fig. 8).



Fig. 1: Initial visit. Patient presents with failing implants, failing fixed partial dentures and fractured prostheses.



Fig. 2: Initial intraoral presentation. Edentulous maxilla with failing, malpositioned implants after prosthesis removal.



Fig. 3: Initial intraoral presentation. Partially edentulous mandible with failing, fixed partial dentures.



Fig. 4: Initial panoramic x-ray.



Fig. 5: Mandibular 3D printed surgical guide

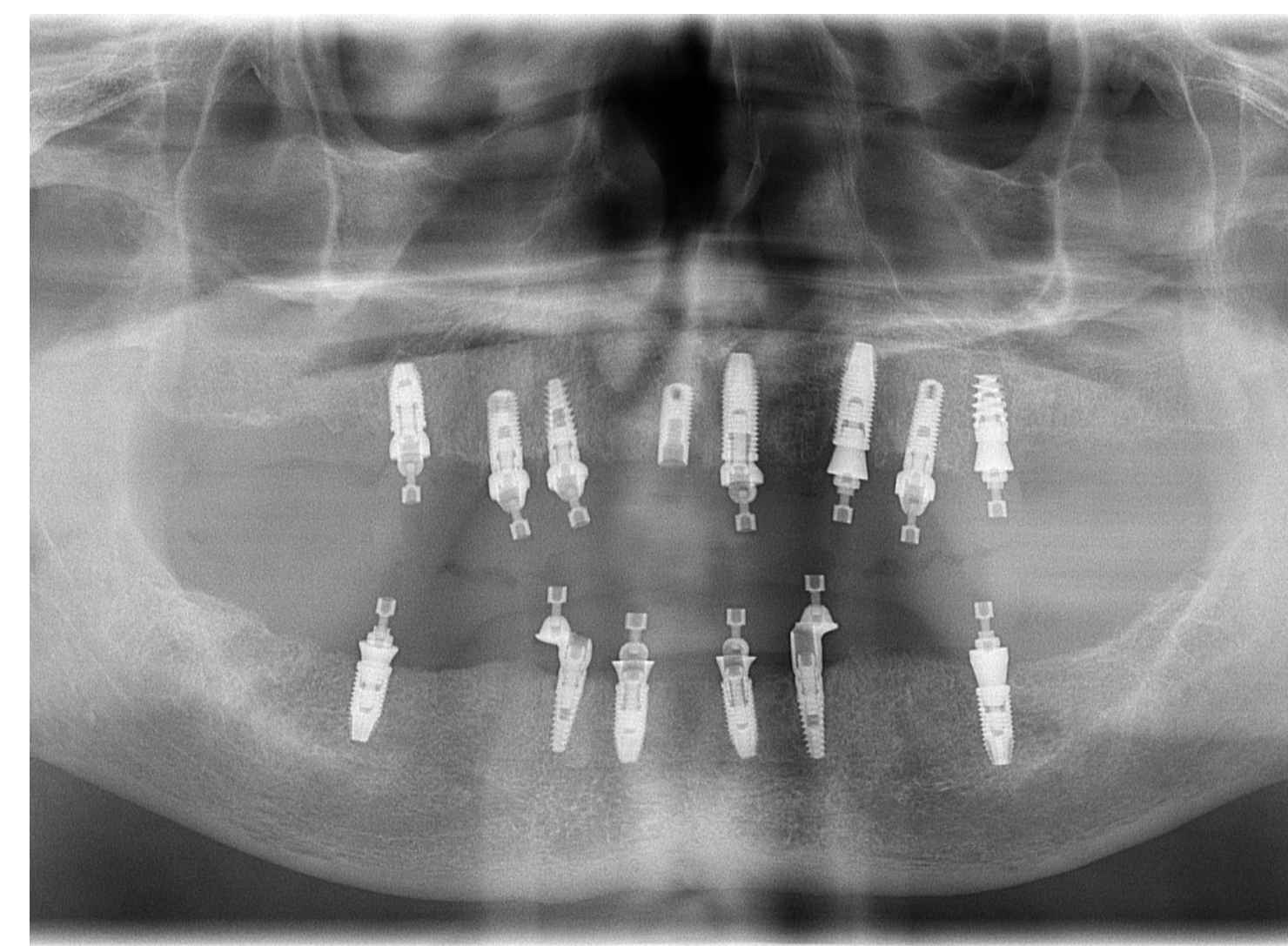


Fig. 6: Panoramic after completion of maxillary and mandibular implant surgeries and placement of MUAs.



Fig. 7: Soft tissue record was obtained with MUA healing caps using an intraoral scanner.



Fig. 8: Scan bodies (ICAM Body) screwed onto the multiunit abutments. Scan bodies are positioned to allow maximum visualization of targets by camera.



Fig. 9: Final maxillary full-arch implant-supported fixed prosthesis with titanium substructure frontal view.



Fig. 10: Final maxillary and mandibular full-arch implant-supported fixed prostheses with titanium substructures intaglio surfaces.

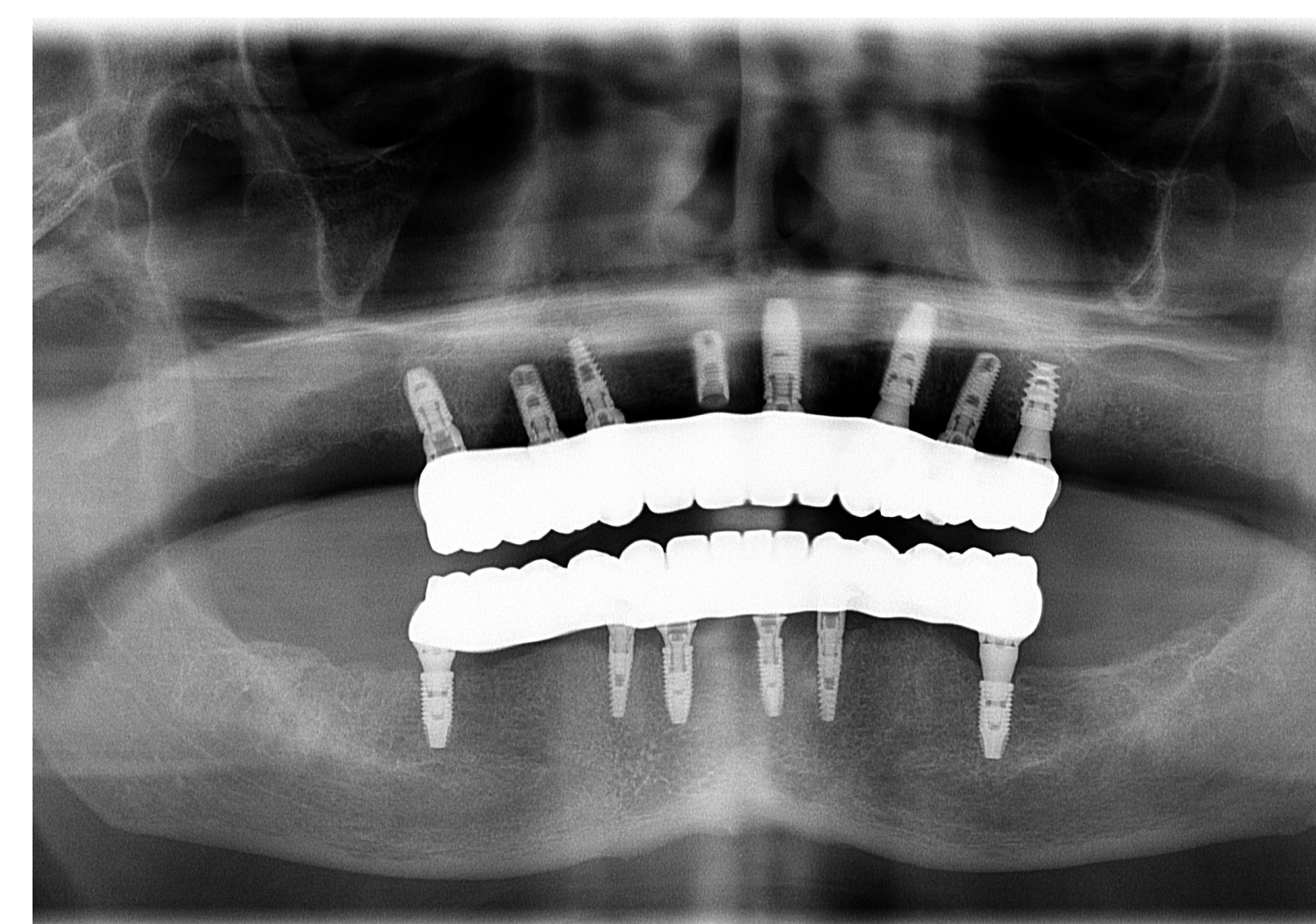


Fig. 11: Final panoramic after delivery of maxillary and mandibular fixed prostheses.



Fig. 12: Full frontal view showing final esthetic and functional rehabilitation.

Anterior maxillary prototype was used to **assess esthetics and phonetics**.

Full-arch implant-supported **fixed** prostheses with **titanium substructures** were fabricated for the edentulous maxilla and mandible, fully **restoring patient's VDO, esthetics and functionality**. (Fig. 9, Fig. 10, Fig. 11, Fig. 12).

Photogrammetry in Full-arch Implant Rehabilitation

Photogrammetry is a *novel digital impression* technique that utilizes an extraoral device to *capture the precise intra-oral positions of multiple implants in full arch cases*. This technique utilizes *photographic images* to determine the *geometrical properties* and *spatial arrangement* of objects.

Step 1: Pre-operative digital scans of the wax try-in were obtained to record the new vertical dimension and incisal position using Trios 5 scanner.

Step 2: Soft tissue record was obtained with MUA healing caps using an intraoral scanner. Intraoral scan bodies were used to scan lower crown preparations.

Step 3: Scan bodies (ICamBody; Imetric 4D) were positioned and hand tightened on each implant, and an ICam 4D extraoral camera was used to digitize position of the implants.

Prostheses Fabrication:

CAD/CAM software was used to design and fabricate a **maxillary full-arch PMMA prototype and lower survey crowns**. Prototype was delivered at the new VDO and used to assess esthetics, phonetics, midline, overjet and overbite. Final **esthetic rehabilitation** was accomplished with a **full-arch implant-supported fixed prosthesis with titanium substructures**.

Conclusion

The incorporation of innovative **digital technologies** facilitates planning and execution of **full-mouth rehabilitation** in patients with failing previous treatment. Digital technologies allow for **shortening of appointment times, accurate planning and execution** of surgical steps as well as **simplification** of clinical and lab steps, while providing **high patient satisfaction**.