Virtual Patient-Assisted, Completely Digital Workflow for Fully Guided Maxillary Full-Arch Rehabilitation with Immediate Implant Placement and Loading: A Case Report

Yu Jen Chen DDS, Junying Li DDS, MS, PhD, Fei Liu DDS, PhD, FACP, Berna Saglik DDS, MS, FACP

Department of Biologic and Materials Sciences & Prosthodontics, University of Michigan School of Dentistry

OBJECTIVE

Full arch implant rehabilitation requires precise treatment planning and seamless collaboration between surgical and prosthetic teams. The virtual patient workflow offer significant benefit to this process. This case report aims to describe the digital workflow for virtual patient-assisted full arch rehabilitation with implant-supported fixed dental prosthesis.

INTRODUCTION

Recent technological advances have increased the use of digital tools like CBCT, intraoral, and extraoral scanners in dentistry. These tools are integrated into diagnostics and treatment, allowing for the use of CAD/CAM technology to fabricate precise prostheses and implant templates. The virtual patient workflow creates a simulated patient by superimposing 3D images of the patient's face, teeth, and oral structures. This process reduces the number of required appointments while maintaining high-quality digital dental implant surgery planning and prosthetic design.

CASE REPORT

A 52-year-old male patient presented to the clinic with concerns about the unsatisfactory appearance of his smile, limited chewing function, and pain during eating. He had previously undergone multiple root canal treatments and crown placements, but recently experienced complications. The patient was in good general health with no significant medical history. Clinical and radiographic examinations revealed extensive caries, non-restorable fractured teeth, soft tissue inflammation, tooth mobility, residual roots, and missing teeth. He was diagnosed with generalized periodontitis (Stage IV, Grade B; Figures 1a - 1d). His previous dentist had recommended implant-assisted removable partial dentures for both arches. However, due to the patient's strong gag reflex, he was seeking a fixed solution for the maxilla.

Pre-treatment

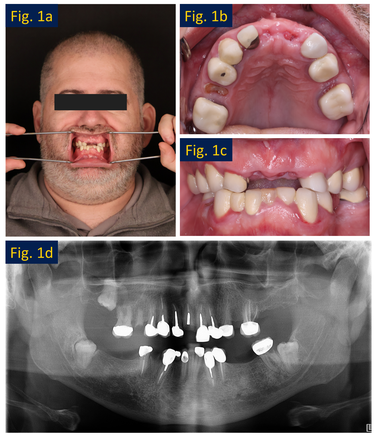

Fig. 1. Pre-treatment condition. 1a. Facial photo with retractors. 1b. Upper arch occlusal view. 1c. Intraoral frontal view. 1d. Panoramic radiograph.

Digital Planning

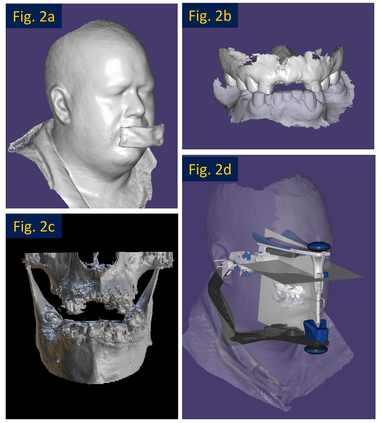

Fig. 2a. 3-dimensional face scan. 2b. Intraoral scan. 2c. CBCT scan. 2d. Virtual patient created by superimposed all three data .

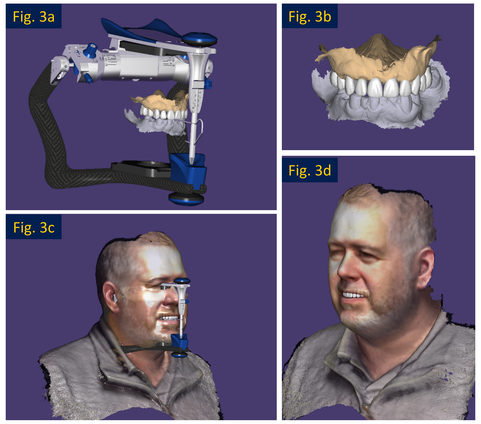

Fig. 3a/b Digital wax-up for the upper arch. 3c/d. The face scan from the virtual patient helps design the anterior teeth wax-up and creates a smile that aligns harmoniously with the

A stage approach was utilized whereby the first premolar and canines on both sides were preserved to retain a tooth-supported interim fixed partial denture. During this phase, the increased vertical dimension and proposed incisal position were tested.

Fig. 4a. Smile view with the interim FPD. 4b. 3D printed interim FPD.

Fig. 5a/b. The first surgical guide was used to prepare the anchor screws recipient sites under local anesthesia.

Fig. 5c/d. Most of the remaining maxillary teeth were extracted and the second surgical guide featured with the same anchor screw sites of the first guide, was secured in the patient mouth and used to guide the implant drilling and placement.

Fig. 5e. Six Straumann BLX implants were placed using a fully guided flapless approach

Fig. 5f. Photogrammetry

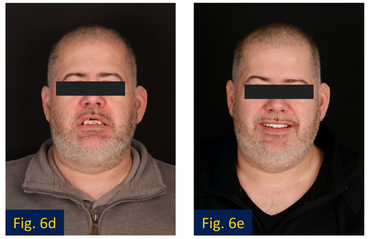

Fig. 6a/b/c. The FP1 milled acrylic interim prosthesis.
Fig. 6d. Pre-treatment smiling view
FIg. 6e. Post-treatment smiling view

DISCUSSION

Recent technological advancements have expanded the use of various digital applications in dentistry. Among these is the virtual patient workflow, which creates a detailed virtual model containing essential functional and aesthetic information for complex clinical treatment planning and execution. This case report presents a fully digital workflow using virtual patient-assisted full-arch rehabilitation with an implant-supported fixed dental prosthesis. This innovative approach enables precise treatment planning and seamless coordination between the surgical and prosthetic phases, making it especially beneficial for patients with a strong gag reflex who cannot tolerate traditional impression techniques. However, further research is needed to confirm the accuracy of these technologies before virtual patient simulations can become a standard in routine dental practice.

CONCLUSSION

The virtual patient workflow serves as an invaluable tool for dental treatment. It offers a smooth and efficient approach integrating face- and prosthetic-driven implant planning for full arch rehabilitation.