

"Integrative Digital Dentistry: Harnessing Photogrammetry, 3D Facial & Intraoral Scanning for Precision Delivery of 3D Printed Fixed Completed Denture in a Single Appointment"

Marissa L. Gentle DMD^a, Blake Roney^b, Kevin Lim^c DMD MS, Soni Prasad^d BDS,MS, FACP, MBA
Resident^a, Certified QT^b, Clinical Faculty^c, Program Director^d

Courtesy of UNC Grad Prosthodontics: Patient Authorization for the Use, Access and Disclosure of PHI, Photography, Videotaping or Recording of Care



Purpose

In the realm of dental innovation, the confluence of digital technologies has paved the way for precise, patient-centric solutions. This case presentation and digital workflow elucidates a procedure devised for producing a 3D-printed fixed complete denture prototype. The approach combines immediate loading by conversion¹, photogrammetry^{2,3}, 3D face scanning, and intraoral scanning, thereby ensuring an unparalleled blend of precision, aesthetics, and time-efficient prosthesis for the patients.

Case Report

A 66 year old female presented with failing maxillary dentition, requiring an implant supported fixed complete denture. After implant placement and successful osseointegration, a digital approach was adopted to streamline the prosthesis fabrication process.

Methods

Photogrammetry: MicronMapper S.I.N. 360 Photogrammetry was specifically utilized to capture detailed data on the location of the implants, allowing the capture of spatial geometry of the patient's implants.

This data is fundamental in developing a patient-specific digital model that integrates both the hard and soft tissue elements seamlessly.

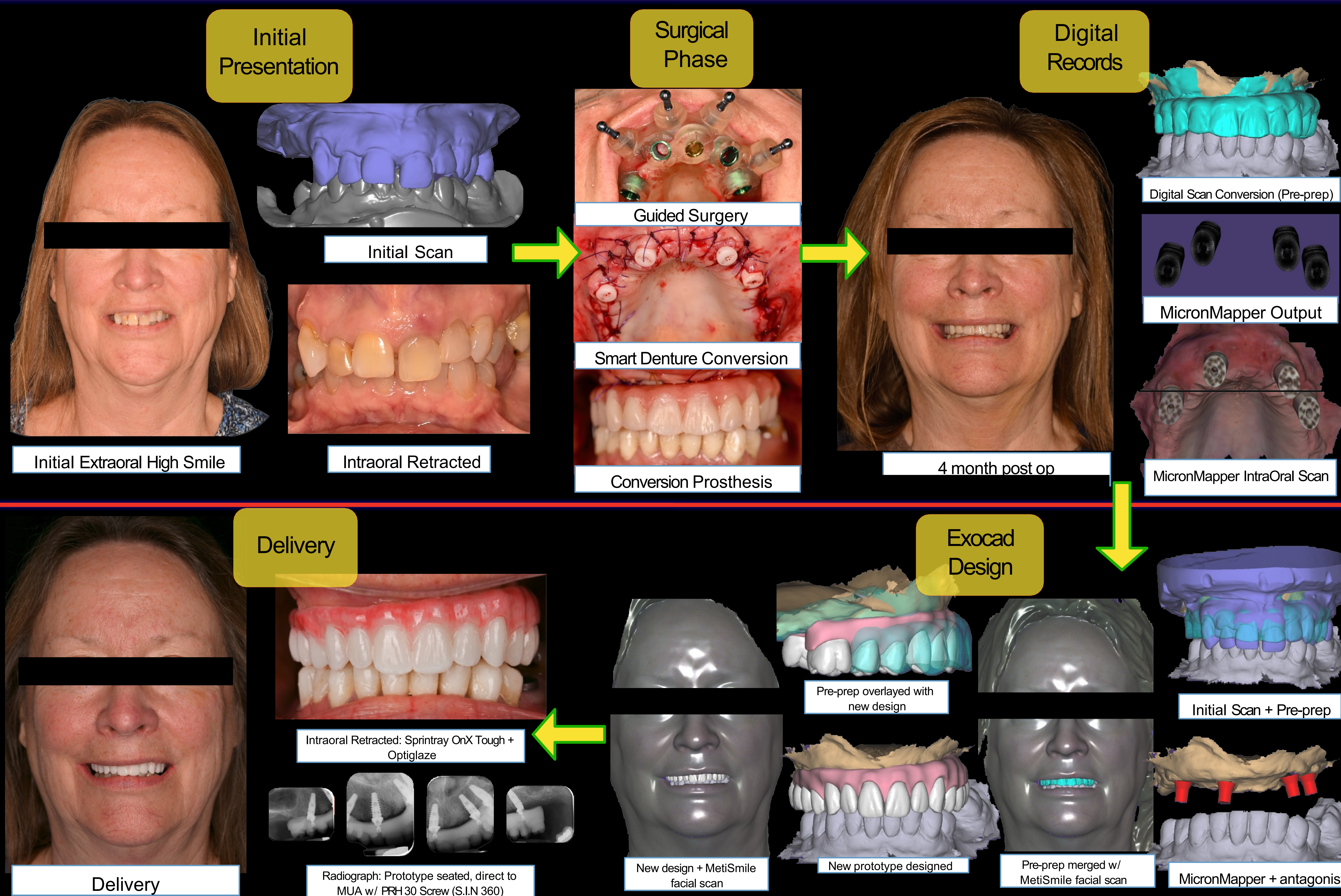
3D Face Scanning: MetiSmile, A 3D face scanning procedure was conducted to obtain a holistic view of the patient's facial esthetics. This ensured the prosthesis would blend flawlessly with natural facial contours, enhancing the overall aesthetics.

Intraoral Scanning: Trios 3 was used to capture the gingival architecture as well as the photogrammetry scan flags.

Design Software: Exocad was used to design the prototype.

Printed Materials: SprintRay OnX Tough

Prototype: Direct to Multi-unit (MUA) w/ PRH30 Screw



Discussion

The digital approach significantly reduces the number of appointments required, improving upon traditional methods.

Photogrammetry provides a quick and accurate impression without the need for a verification jig³. In this case, a 3D printed fixed complete denture was created in a single appointment, a notable achievement compared to the conventional multi-step verification process. Additionally, a novel technique was employed to remove the stock abutment from the interim prototype, using a longer screw to engage the MUA. This approach addresses issues such as stock abutment de-bonding, human error in abutment cementing, and monolithic restoration fractures due to inadequate material thickness. While this technique uses an FDA-approved screw, research on it is limited. The patient has worn the prototype for four months with no fractures or screw loosening. OnX Tough material was used for this prototype, supported by Brenes et al., who noted that most catastrophic failures occur at the stock abutment fixture level in interim prostheses⁴.

Results

This case report demonstrates the power of integrative digital dentistry, using photogrammetry, 3D face scanning, and intraoral scanning to transform prosthesis creation. It boosts precision, enhances aesthetics, and improves functionality while reducing chair time. This sets a new standard in dental practice, with digital dentistry promising more innovations to reshape prosthodontics for the benefit of patients and clinicians.



References



FOLLOW US ON