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Complete dentures using a full digital protocol



Solutions featured:

3Shape TRIOS® 4 intraoral scanner
3Shape Dental System
3Shape E3 lab scanner

3shape 

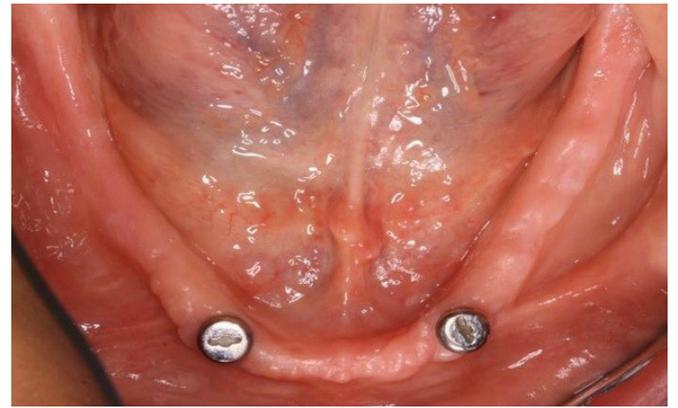


Fig. 1a, 1b. Edentulous ridges. A. Maxilla. B. Mandible

Case information

A 56-year-old female edentulous patient was referred after two mandible implant placements.

Background

For a completely edentulous patient, a complete denture is chosen as the main prosthetic treatment option. The mucostatic concept protocol should be considered and followed during digital scanning. This mucostatic approach is proven to be more effective than the conventional one for thin or sharp mucosa biotype and flabby ridge cases. This digital protocol allows for all the clinical steps to be performed in a single visit. Trial dentures provide good evaluation of function and esthetics before definitive prosthesis insertion.

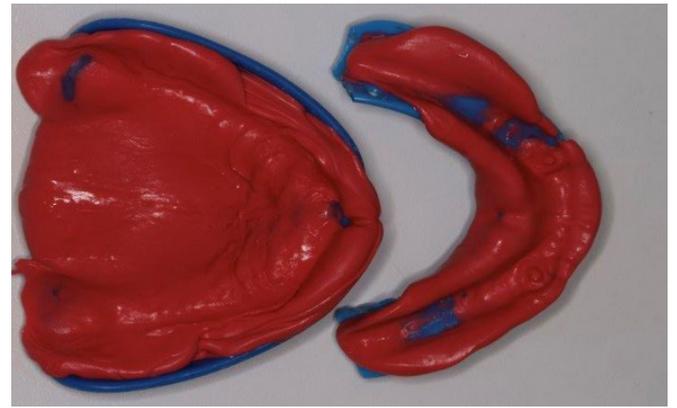
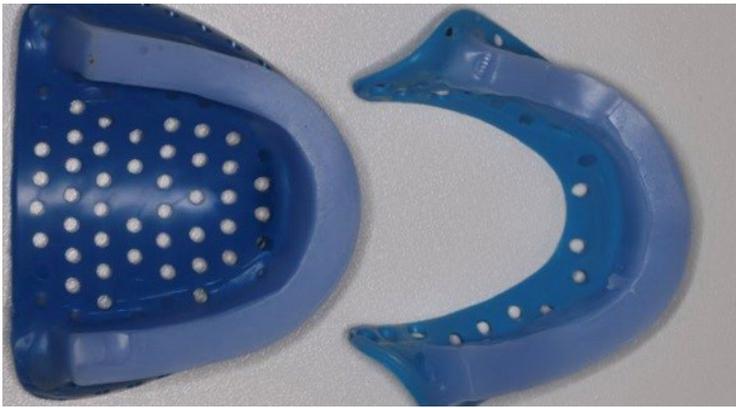
Treatment plan

The treatment plan called for a maxillary complete denture and implant retained overdenture in the mandible. The treatment goal was to accomplish all clinical steps in a single visit using the benefits of 3Shape TRIOS and 3Shape Dental System digital workflow.



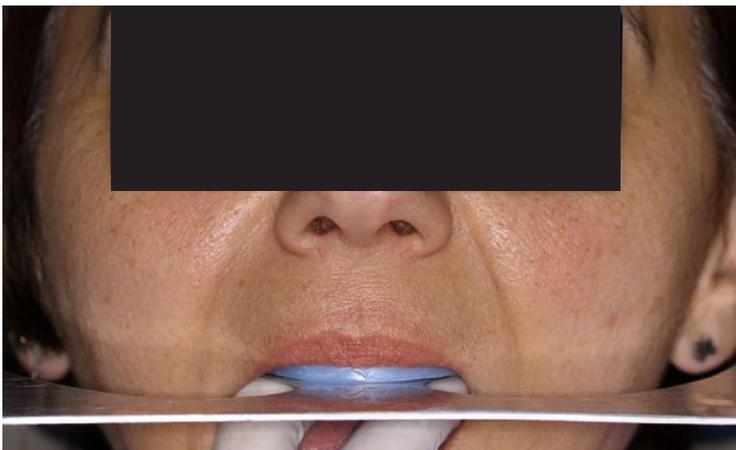
Fig. 2a, 2b. A. Maxillary. B. Mandibular

A 3Shape TRIOS 4 intraoral scanner was used to perform digital scanning of the edentulous arches. The Standard Tessellation Language (STL) files were sent to the laboratory via 3Shape Communicate®.



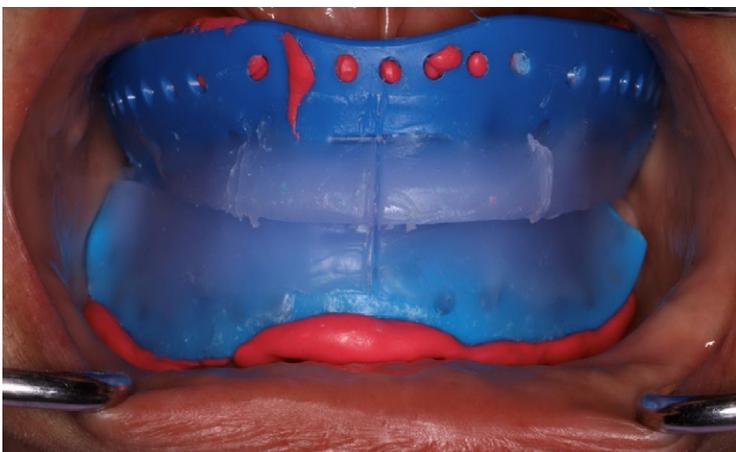
**Fig. 3a, 3b. A. Rims on edentulous stock trays.
B. Tray-rim assemblies intraorally relined with Poly-vinyl-siloxane.**

The appropriately sized edentulous stock plastic trays (COE; GC America Inc) for both ridges were chosen. An intraoral reline using medium viscosity polyvinylsiloxane (PVS) material was used to conform to arch form and provide retention and stability.



Esthetic and functional parameters were determined with modifications to wax rims performed according to the patient's facial esthetics and lip support, facial midline, canine position, smile line and occlusal plane.

Fig. 4



The registering of the Centric Relation was determined for the appropriate Vertical Dimension. The wax rim height was adjusted to an acceptable Vertical Dimension of Occlusion (VDO), with the Perform Centric Relation (CR) recorded in the selected VDO.

Fig. 5

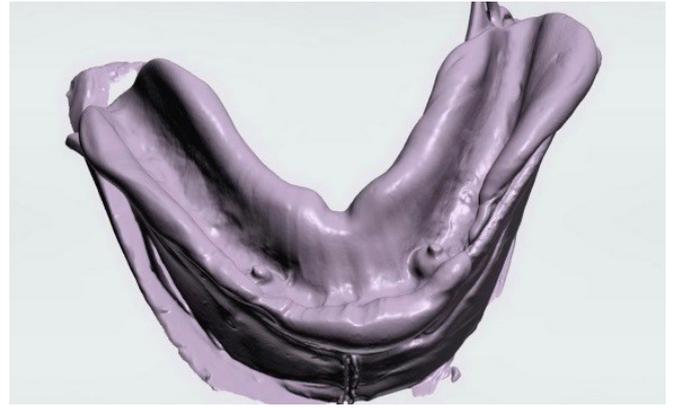
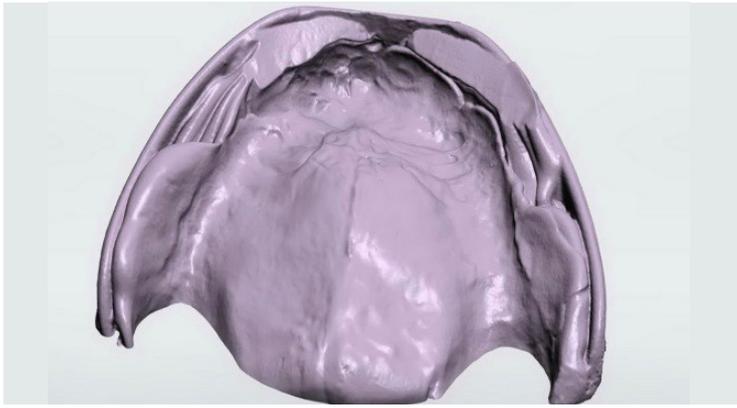


Fig. 6a, 6b. A. Maxillary. B. Mandibular

The Tray/rim digitized assemblies are scanned using a 3Shape E3 laboratory scanner with the registration transferred to an STL file.

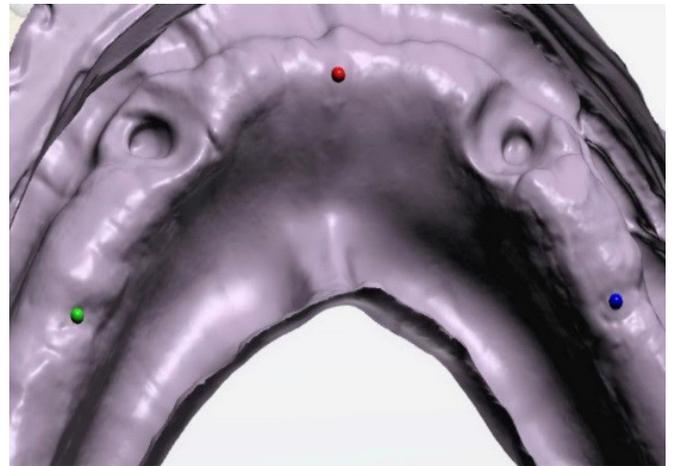
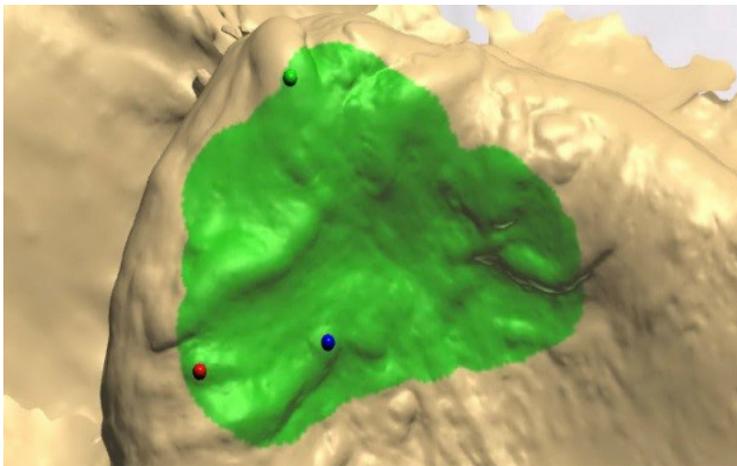
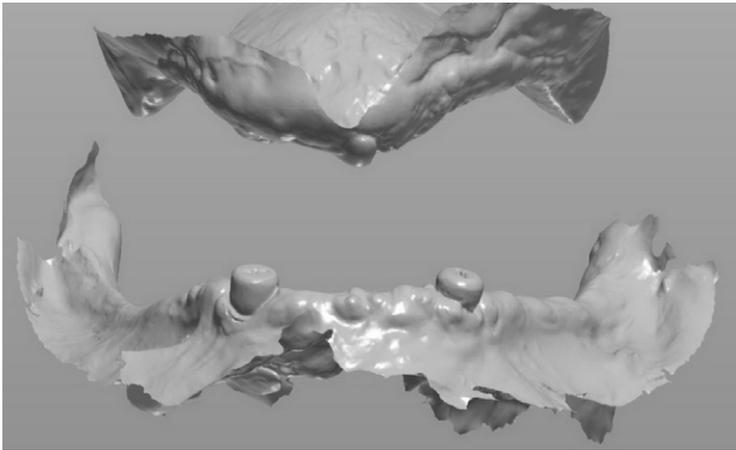


Fig. 7a, 7b. A. In maxillary intraoral scanning. B. In mandibular laboratory scanning.

Three-point anatomical markings are made to register and allow superimposing and articulation. These are superimposed to the IOS STL files and the laboratory STL files.



The workflow allows for the simultaneous articulation of digital casts, digital base plates, and wax rims and digital records.

Fig. 8



Denture bases are digitally designed for full edentulous coverage and maximized retention and lip support. Tooth position and select artificial teeth are taken from available digital teeth libraries in 3Shape Dental System.

Fig. 9a



Fig. 9b



Fig. 10

Try-in prototypes are used to verify esthetics, phonetics, and function. The resulting file is sent to a 3D printer to imitate the conventional wax teeth try-in. It is used to assess clinical parameters such as denture retention, flange extension, esthetics, phonetics, vertical dimension, maxillo-mandibular relation, and occlusion. Any adjustments are performed at this stage.



Fig. 11

The adjusted prototypes are scanned using the same laboratory scanner and the new STL files sent to a milling machine. Milled teeth bonded (SR Vivodent CAD Multi; Ivoclar Vivadent) are attached to the denture base utilizing a self-curing PMMA-based-two-component bonding system (IvoBase CAD Bond; Ivoclar Vivadent). The definite prostheses is polished and glazed. Cross bite is recorded in occlusal rims and transferred to the restoration.



Fig. 12 Final esthetic outcome

Discussion

In the clinical technique presented, two clinical appointments were needed (the second being record confirmation, tooth position, and phonetics) before definitive prosthesis insertion.

Retention was deemed satisfying by the patient and no post-insertion appointment was needed.

Digital mucostatic scanning resulted in slightly under extended denture flanges which allowed for a less functional post-insertion trauma. According to this concept, denture retention is not achieved by the peripheral seal, but is mainly obtained by the intimate contact of the surface of the denture base with the underlying tissues under the principle of surface tension.

References

1. Lombardi R. The principles of visual perception and their clinical application to denture esthetics. *J Prosthet Dent* 1973; 29:358-382.
2. Lo Russo L, Caradonna G, Troiano G, Salamini A, Guida L, Ciavarella D. Three-dimensional differences between intraoral scans and conventional impressions of edentulous jaws: A clinical study *J Prosthet Dent* 2020;123: 264-8.
3. Lo Russo L, Salamini A. Removable complete digital dentures: A workflow that integrates open technologies *J Prosthet Dent* 2018; 119:727-32.

About Dr. George Kouveliotis

George Kouveliotis started his dental education in 2000 at the Department of Dental Technology at University of Western Attica, Athens, Greece. Consequently, in 2006, he was accepted to the Dental School of National and Kapodistrian University of Athens where he graduated in 2011. In 2012, he began a three-year program in Graduate Prosthodontics at the same university. Since 2015, he has been a scientific associate at the Department of Prosthodontics. Dr. Kouveliotis was a board member of the Hellenic Prosthodontic Association from 2015-2019. He is also a member in other Greek and international scientific associations. He is co-Director of ITI Young Athens Study Club. Moreover, he has published many scientific articles in Greek and International journals. Furthermore, he conducts continuous education concerning digital restorative dentistry, prosthodontics, and implantology. Kouveliotis owns a private clinic in Athens since 2012.

About 3Shape

3Shape is changing dentistry together with dental professionals across the world by developing innovations that provide superior dental care for patients. Our portfolio of 3D scanners and CAD/CAM software solutions includes the multiple award-winning 3Shape TRIOS intraoral scanner as well as market-leading scanning and design software solutions for both dental practices and labs.

Two graduate students founded 3Shape in Denmark's capital in the year 2000. Today, 3Shape has over 1,600 employees serving customers in over 100 countries from an ever-growing number of 3Shape offices around the world. 3Shape's products and innovations continue to challenge traditional methods, enabling dental professionals to treat more patients more effectively. www.3shape.com

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