

Pro Esthetic Dental Services
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Full digital workflow for duplication of an implant retained overdenture: A novel approach



Solutions featured:

3Shape TRIOS®4 intraoral scanner
3Shape Dental System software

Background

Many denture wearers require replacement dentures when the same set has been worn for a long time. Elderly patients may find it difficult to control and adapt to new dentures which can differ in shape from their existing set. The capacity to adapt to change is often reduced with age as is the difficulty in controlling new dentures because of differences in shape from the existing set. This case demonstrates the reproduction of the polished surfaces of the existing dentures using a novel, simple method of fully digital copy denture technique. It demonstrates an easy and predictable way to reproduce a denture for patients that feel very comfortable with the fit and/or esthetics of their existing denture.

Case information

A 78 -year old healthy female was referred to our private dental practice for replacement of her existing lower broken implant retained overdenture. Clinical examination demonstrated general deterioration of the denture base material. Dental history revealed multiple excessive fractures and repairs of the broken existing denture, which appeared as a result of flexural fatigue for over 10 years. Furthermore, artificial teeth were worn down and slightly discolored. She was generally satisfied with her mandible denture and aiming at improving the retention of the prosthesis.

Treatment plan

After reviewing treatment options, the patient decided to have a new implant retained mandible prosthesis with a Polyether Ether Ketone (PEEK) framework insert to reinforce the milled Poly (methyl methacrylate) (PMMA) denture base resin.

Patient's existing broken mandible implant retained overdenture.



Fig. 1

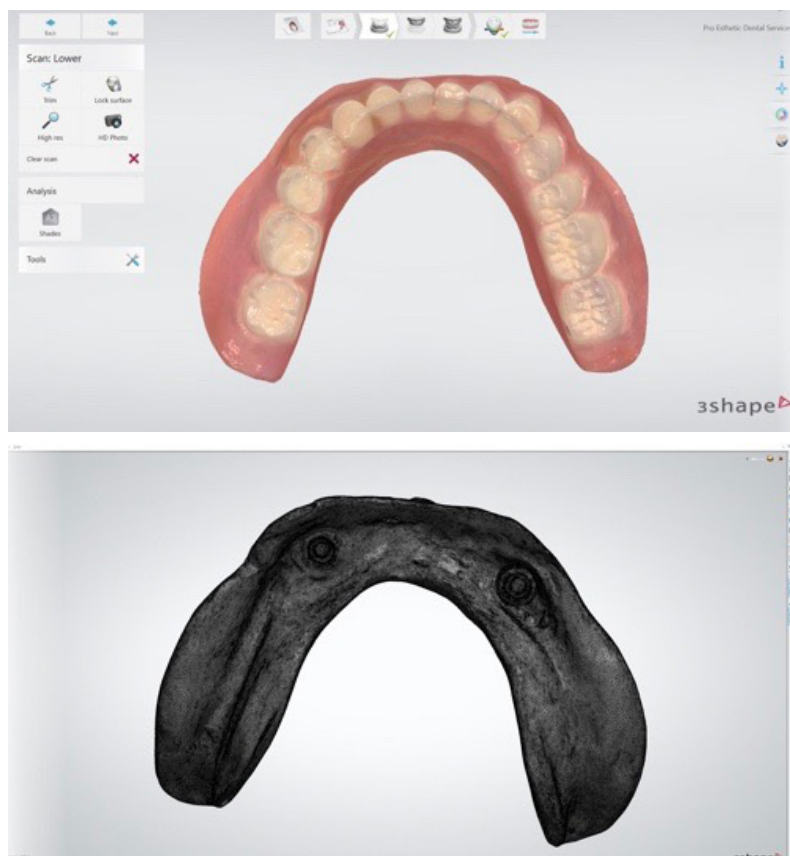


Fig. 2

All the surfaces of the lower denture were scanned chairside, using TRIOS 4 intraoral scanner. This scan generated an STL file format and was sent directly to a 3d printer.



Fig. 3

A duplicate of the patient's existing prosthesis was printed. The 3d printed denture replica was trimmed in the midline. Two equal pieces came out from the acrylic model.



Fig. 4

The one half of the copy denture was seated intraorally onto locator abutment.

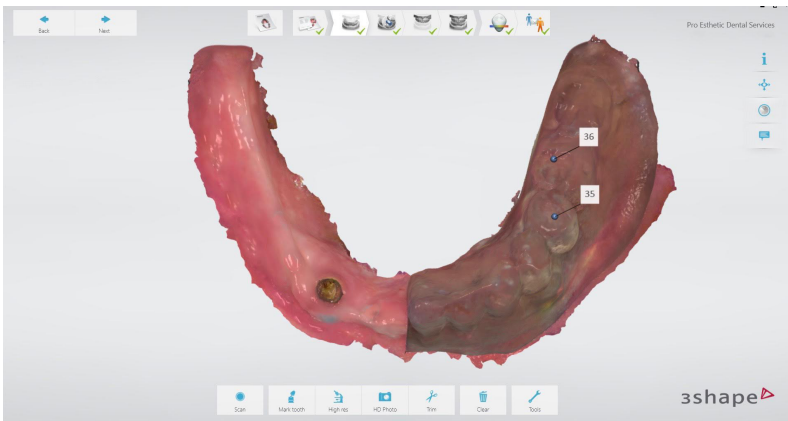
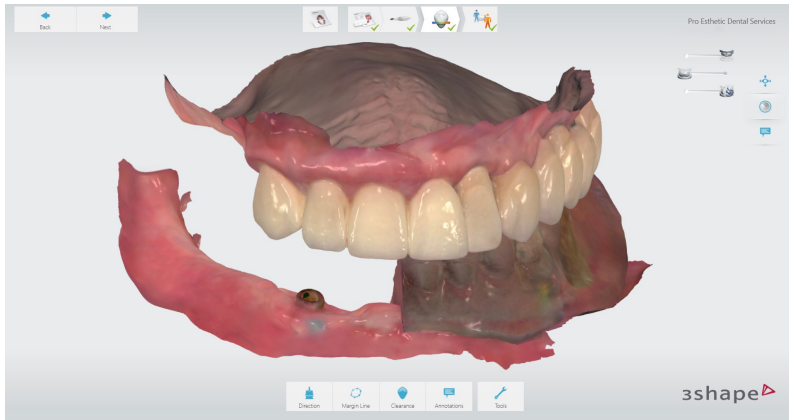


Fig. 5

A pre-preparation intraoral scan was obtained with the one half of the 3d printed copy denture in situ.



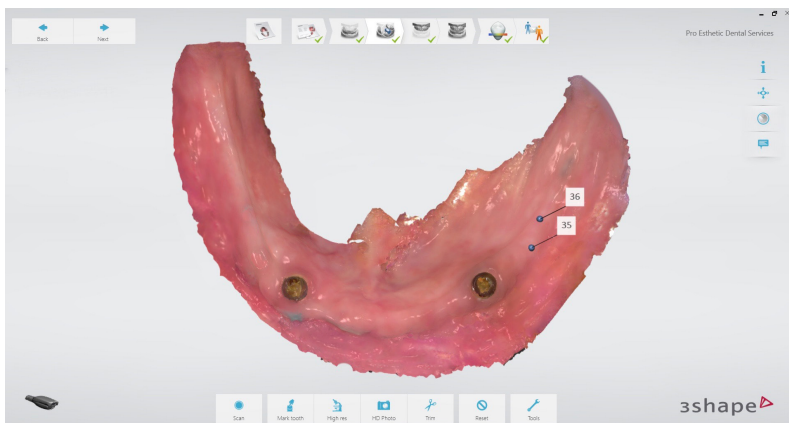
Digital impression of the opposite dentition and bite registration of the jaws were scanned, using 3Shape TRIOS 4.

Fig. 6



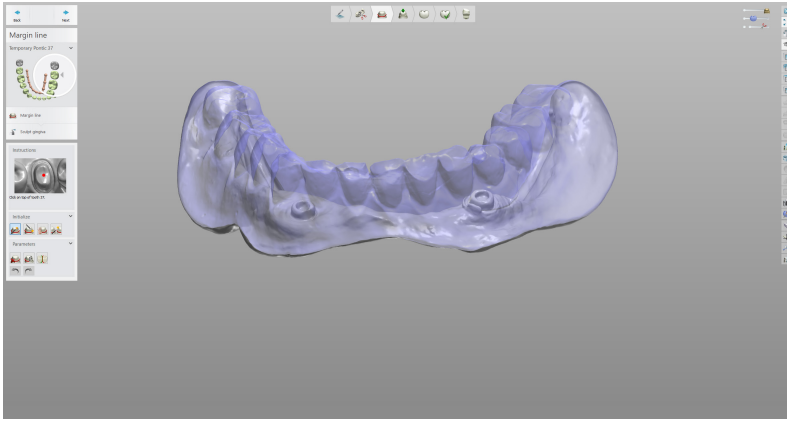
Moving to the final step, the pre-preparation scan was edited and the area of the 3d printed denture was deleted.

Fig. 7



Definite intraoral impression of the lower jaw was made from rescanning (capturing) only the relevant region.

Fig. 8



Alignment of pre-preparation and final impression scan using 3-point method available in 3Shape Dental System.

Fig. 9



The milled trial copy denture (ProArt CAD try in/Ivoclar Digital).

Fig.10



The monoblock try in denture utilizing the ProArt CAD try in replaces the conventional wax teeth try-in, allowing the clinician and the patient to evaluate the main clinical parameters such as the esthetics, phonetics, occlusion and maxillomandibular relation. Moreover, clinical assessment includes fit of the denture, flange extensions and retention of the denture base. Following the milling process, trial denture was covered with a thin layer of pink wax.

Fig. 11



While creating the STL file of the definite denture base, CAD software designs automatically and accurately the cavities for the teeth. Permanent denture teeth were also selected from available libraries and milled from a 20-mm thick tooth-coloured disc (SR Vivadent CAD/Ivoclar Digital).

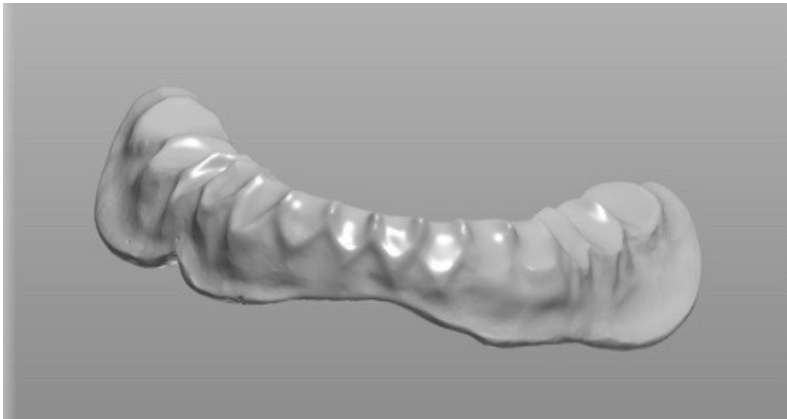


Fig. 12



Once approved, the denture base was milled from a PMMA puck (IvoBase CAD/Ivoclar Digital). Finally, a poly-ether-ether (PEEK) reinforced mesh was also constructed, utilizing CAD/CAM technology.

Fig. 13



The seated mandible definite implant retained overdenture. Intaglio surface of the mandibular overdenture was evaluated with pressure indicating paste, showing excellent adaptation with underlying tissues immediately after the final delivery of the prosthesis and before any adjustments.^{1,2,3}

Fig. 14



Processing the locator denture attachment metal housings and inserts into the denture, using the direct technique.

Fig. 15



Definite prosthesis was seated in patient's mouth. The selected final inserts into place, providing sufficient retention. Occlusion was verified and the patient was instructed about on proper home maintenance and advise for required recall visits.

Fig. 16 i



Fig. 16 ii

Discussion

The fully digital protocol for denture duplication followed in this case, demonstrates an easy and predictable way to assist patients that feel very comfortable with the fit and/or esthetics of their existing denture. Moreover, the laboratory now has an STL file of the milled denture, so this overdenture can be replicated at any time without additional patient visits. Modern literature clearly supports the high accuracy of edentulous arches scans. Intraoral scanners (3Shape TRIOS 4) are based on mucostatic impressions and denture retention is obtained mainly by the intimate contact of the surface of the denture base with the underlying tissues under the principle of surface tension.^{1,2,3}

About Dr. Theodoros Tasopoulos

Dr Theodoros Tasopoulos graduated from the School of Dentistry at the National and Kapodistrian University of Athens in 2004. He continued his studies at the University of Bristol (United Kingdom) and received his Master's degree in Prosthetic Dentistry. Dr Tasopoulos is the author of specialist publications in the field of Prosthodontics and Dental Materials. Furthermore, he conducts continuing education courses in the field of digital restorative dentistry, mouthguards and splint therapy. He has been practicing in his own clinic in Athens, since 2008.

References

1. Lo Russo L, Caradonna G, Troiano G, Salamini A, Guida L, Ciavarella D. Three-dimensional differences between intra oral scans and conventional impressions of edentulous Jaws: A clinical study. *J Prosthet Dent* 2019; (Epub ahead of print).
2. Tasaka A, Yuuki U, Tomoharu M, Takao K; Takuya; Homma T, Matsunaga S, Abe S, Yoshinari S, Yajima M, Sakurai Y, Yamashita K, Shuichiro. Applying intraoral scanner to residual ridge in edentulous regions: in vitro evaluation of inter-operator validity to confirm trueness. *BMC Oral Health* 2019; 19 (1): 1-10.
3. Lo Russo L, Ciavarella D, Salamini A, Guida L. Alignment of intraoral scans and registration of maxillo-mandibular relationships for the edentulous maxillary arch. *J Prosthet Dent* 2019; 121 (5): 737-740.

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 for the dental industry includes the multiple award-winning 3Shape TRIOS® intraoral scanner, the upcoming 3Shape X1® CBCT 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 1,500 employees serving customers in over 100 countries from 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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