NYC Prosthodontics
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Full-coverage crown restorations on seven maxillary teeth and six mandibular teeth

Digital Workflow:
clinical patient information
digitally obtained and shared

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3shape

Fig. 1, 2

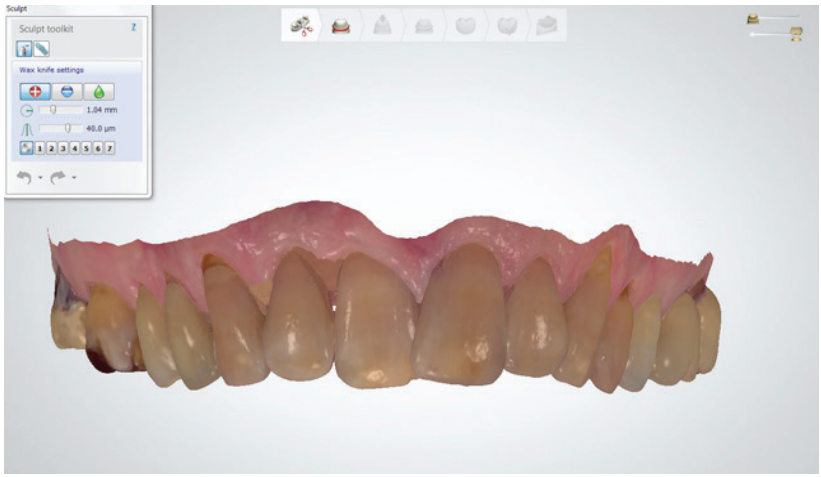

Fig. 3, 4

Background

Digital intraoral scanners, as well as stand-alone and complete computer-assisted design (CAD)/computer-aided manufacturing (CAM) equipment are powerful and efficient tools in today's dental practices. They eliminate the need for traditional analog impressions and wax-ups, as well as the conventional hands-on fabrication processes associated with all-ceramic restorations [1].

As a result, in one digitally centered workflow that could be implemented, impressions are taken with an intraoral scanner, not conventional materials and trays. Computer software is used to digitize, analyze and manipulate the scanned images, instead of pouring models. Restorations are designed with CAD software, not by hand-waxing models, after which they are milled through a CAM process, rather than by pressing and/or layering.

Case information

A male patient in his mid-60s presented with a chief complaint about the esthetics of his anterior maxillary and mandibular teeth (crowding, severe tetracycline staining) (Figs. 1 and 2). Orthodontic treatment was suggested. However, because the patient had fairly significant sleep apnea requiring nighttime wear of a custom-molded device, he declined this option.

An initial scan of the patient's preoperative condition was completed using a digital intraoral scanner (3Shape TRIOS) (Figs. 3-6). This eliminated the need for traditional analog impressions [2].

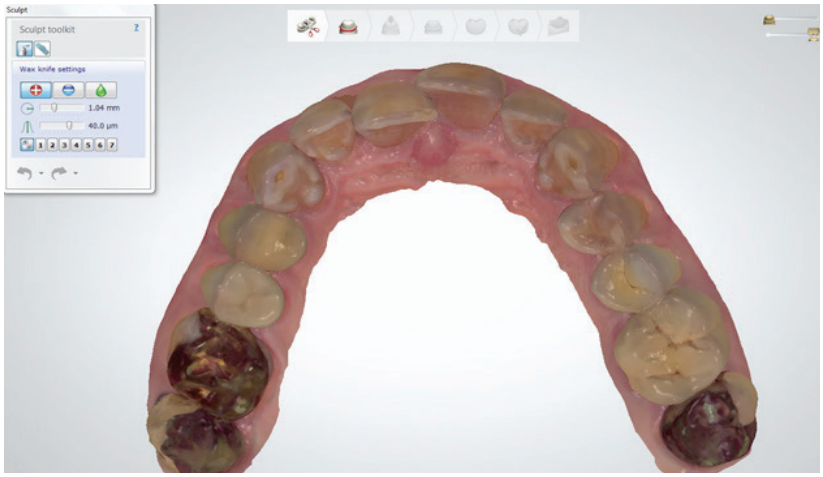

Fig. 5

Fig. 6

Fig. 7

Using dental CAD software (3Shape), the scans were manipulated to virtually alter the patient's existing dentition into the final restorative state, create a digital diagnostic wax-up, and demonstrate treatment options to the patient (Fig. 7), all without patient discomfort or the time-consuming steps involved with traditional impressions and models. The proposed treatment involved placing milled monolithic lithium disilicate (IPS e.max CAD, Ivoclar Vivadent) full-coverage crown restorations on seven maxillary teeth (#6 through #12) and six mandibular teeth (#22 through #27). The patient approved the treatment plan.

Fig. 8

Fig. 9

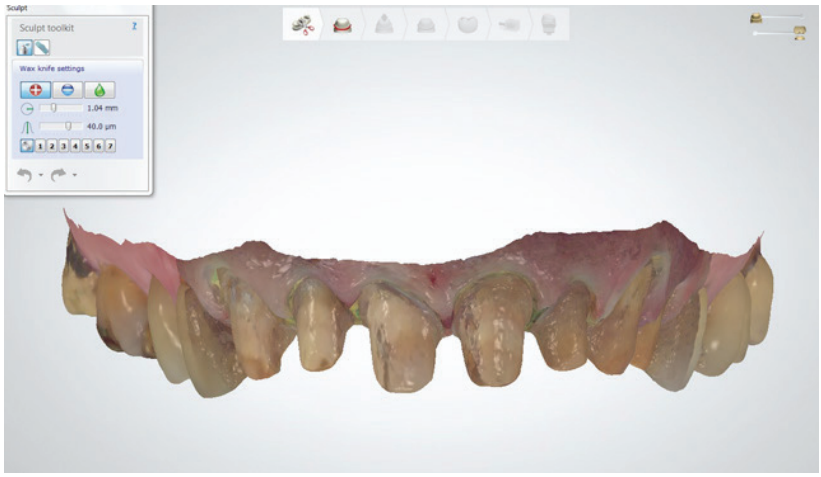

Fig. 10

Preparation and provisionalization

The initial assessment indicated that the treatment was too extensive to complete in one day. However, the digital diagnostic wax-up enabled more efficient tooth preparation and provisionalization. Based on the digital wax-up, provisionals were milled in the practice prior to the second appointment from PMMA blocks (Telio CAD, Ivoclar Vivadent), which eliminated the challenges associated with traditional temporization processes (e.g., polymerization shrinkage, clean up, impression and mixing errors) [3]. These CAD/CAM created provisionals also contributed to an ideal fit, strength, and durability.

During the second appointment, the teeth were prepared (Figs. 8 and 9) and digital scans taken (Figs. 10 and 11).The milled provisionals were relined, cemented and customized, enabling the patient to "test-drive" the proposed treatment and share his desired alterations prior to fabricating the permanent restorations. The patient completed a one-week trial period and, upon returning, requested modifications to the maxillary provisionals, which were made.

Fig. 11

Fig. 12

Fig. 13

He returned again two weeks later, at which time he approved the provisionals for comfort, proper occlusion and esthetics. The provisionals were digitally scanned to serve as templates for the final restorations and enhance their predictability by facilitating the design of their shape and occlusion (Figs. 12 and 13) [4].

Fig. 14

Fig. 15

Fig. 16

Final restoration design and fabrication

Even when provisionals are required, complete CAD/CAM workflows achieve a fast turn-around and efficiency for designing and fabricating temporary and permanent restorations 5, which was essential to allow the patient to return to wearing his apnea device as soon as possible. The final crowns were designed based on the scanned provisionals (Fig. 14), then wet-milled (E4D) in the practice from medium opacity monolithic lithium disilicate blocks (IPS e.max CAD) in shade A3.5. The selected material contributed to high esthetics, eliminated the challenge of working with different materials and masked the patient's underlying tetracycline stained tooth color 6,7.

A 3D model was designed and printed for use in controlling contact points, occlusion, and surface texture after milling and while characterizing, staining, and glazing the restorations. Based on the same digital information previously obtained, 3D models have been accurate and reproducible 8.

Two weeks after the patient approved the provisionals, the definitive crowns were placed, and the patient was thrilled with the outcome (Figs. 15 and 16).

Conclusion

This case demonstrates that digital dental techniques like intraoral scanning, digital diagnostic wax-ups and CAD/CAM milling are changing the way dentists provide quality treatments. The workflow model here did not require any traditional impressions or models, but relied exclusively on digitally obtained and transferred clinical patient information.

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About Dr. Jonathan L.Ferencz

Education

Dr. Ferencz is an alumnus of Rensselaer Polytechnic Institute and received his dental degree and post graduate specialty certification in Prosthodontics from the New York University College of Dentistry.

Academic appointments

Dr. Ferencz is a Diplomate of the American Board of Prosthodontics and Clinical Professor of Prosthodontics and Occlusion in the Department of Advanced Education in Prosthodontics at the New York University College of Dentistry, where he has taught since 1972, and is Adjunct Professor of Restorative Dentistry at the University of Pennsylvania School of Dental Medicine since 2014.

Proffesional affiliations

Dr. Ferencz is a founding member of the International Academy of Digital Dental Medicine. He is also a member of the American Academy of Restorative Dentistry, the American Academy of Fixed Prosthodontics, the American College of Dentists, the New York Academy of Dentistry, and the American Dental Association. He is a Fellow of the American College of Prosthodontics, the American College of Dentists, the Academy of Prosthodontics, and the Northeastern Gnathological Society. Dr. Ferencz has served as President of the Greater New York Academy of Prosthodontics, President of the Northeastern Gnathological Society, and President of the American College of Prosthodontists.

Awards

Greater New York Academy of Prosthodontics Distinguished Lecturer Award, 2011, American College of Prosthodontists Distinguished Lecturer Award, 2010, Greater NY Academy of Prosthodontics Achievement Award, 2007, NYU College of Dentistry David B. Kriser Medal, 2006, American College of Prosthodontists Presidents Award, 2006.

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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 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 employees serve 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.

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