The use of a scannable impression coping and digital impression technique to fabricate a customized anatomic abutment and zirconia restoration in the esthetic zone

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This report described the fabrication of a customized anatomic abutment and zirconia restoration in the esthetic zone with a digital pathway. The implant level impression was made with a scannable impression coping and intraoral digital scanner. The milled definitive polyurethane cast with corresponding implant analog, customized anatomic abutment, and definitive zirconia restoration were made with a computer-aided design and computer-aided manufacturing (CAD/CAM) process.(J Prosthet Dent 2013;109:187-191)

Traditionally, there are 2 different implant level impression techniques, pick-up (open tray) and transfer (close tray) techniques. The pick-up type impression copings are embedded in the set impression, and access to the retaining screws through the impression is required to allow release of the impression copings along with the impression. The transfer type impression copings are left intraorally when the impression is separated. The impression copings are then removed and connected to implant analogs before reinserting them into the impression for definitive cast fabrication.[1] One systematic review concluded that most studies showed no difference in accuracy of impression between the pick-up and transfer technique when there were 3 or fewer implants; however, the pick-up techniques showed better accuracy when there were 4 or more implants.[2]

The continued evolution of digital dentistry and the computer-aided design/computer-aided manufacturing (CAD/CAM) process has allowed significantly different clinical and laboratory procedures. A definitive cast resulting from the conventional implant level impression can be digitized by using an optical scanner (Nobel Procera Optical Scanner; Nobel Biocare USA, Yorba Linda, Calif) for the subsequent fabrication of anatomic abutment and definitive restoration with the CAD/CAM process.[3] A coded healing abutment (Encode; Biomet 3i, Palm Beach Gardens, Fla) provides an alternative to conventional impression techniques. It provides information on implant restorative platform, antirotational feature orientation, and implant depth. A definitive cast made from an impression of coded healing abutments can be scanned in the dental laboratory, and individualized anatomic abutments can be fabricated with the CAD/CAM process.[4,5] With a recently developed CAD technique (Robocats Technology; Biomet 3i), the implant analog can be retrofitted to the definitive cast without the need for an additional implant level impression.[6]

With a digital impression system (Cadent iTero; Cadent Ltd, Or Yehuda, Israel), the data from the intraoral scanner can be electronically transmitted to the manufacturer for modeling, a modification process where artifacts and nonessential structures are eliminated.[7] The processed virtual analog of the definitive cast can be downloaded in the dental laboratory and the accuracy of scan data verified. The dental laboratory technician can design interim and/or definitive restorations and order a milled defini-

1 Implant-supported interim restoration for maxillary left lateral incisor.

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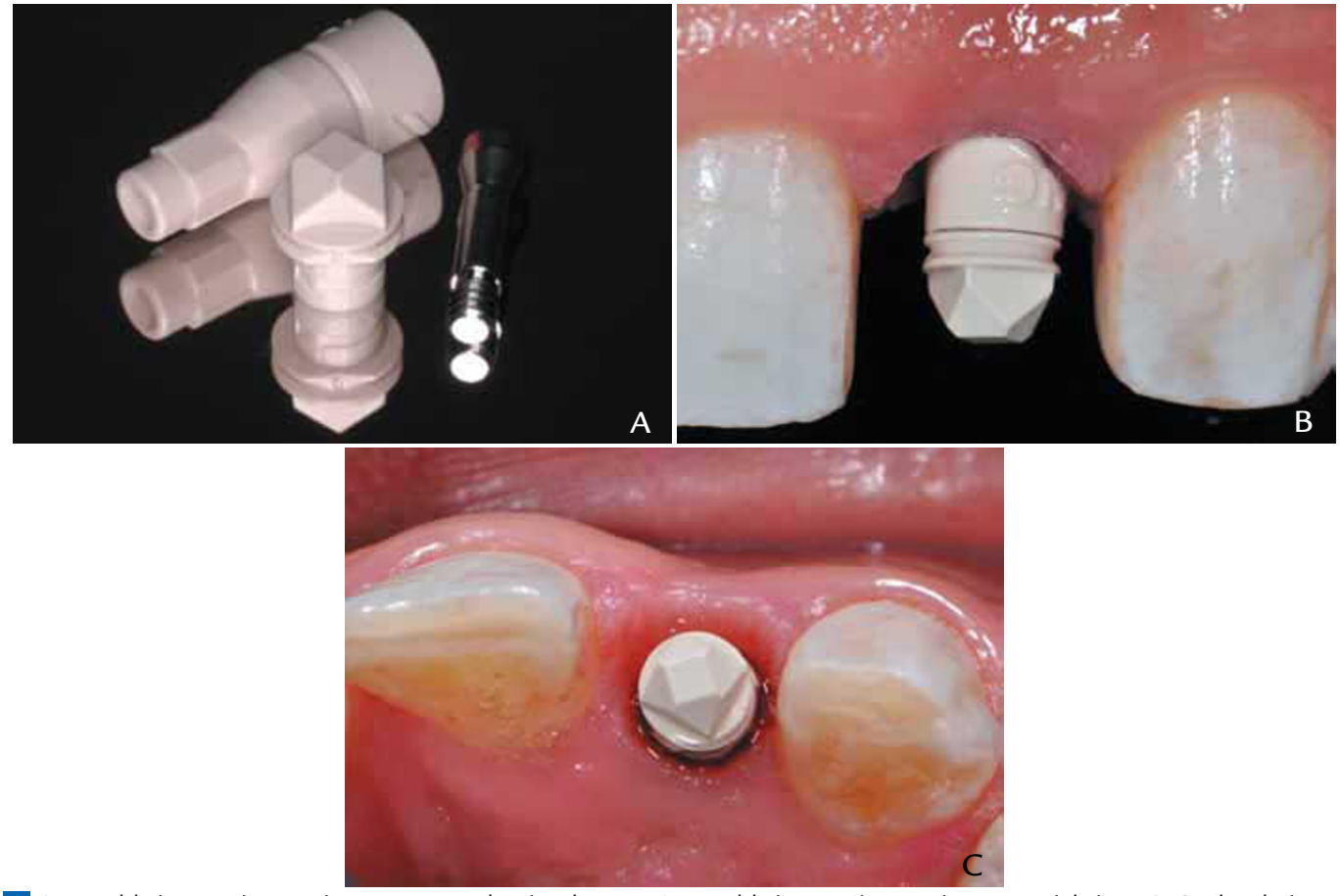
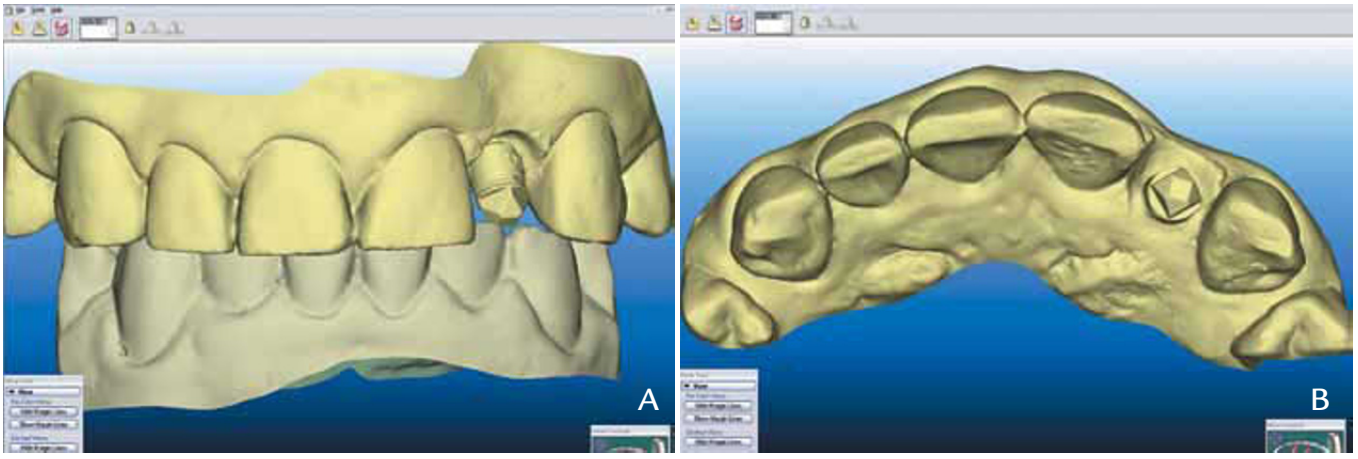
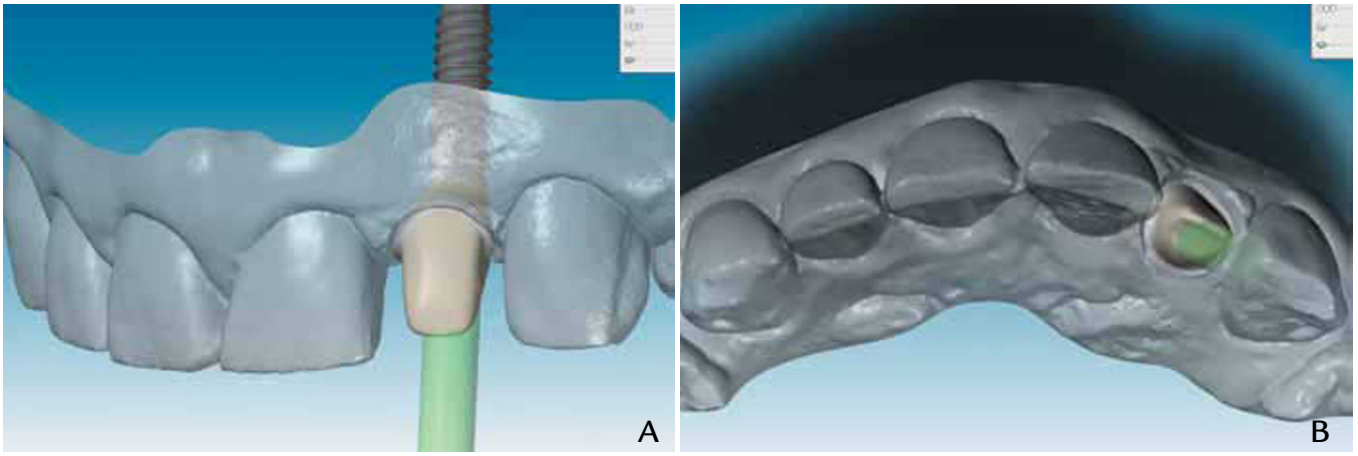


2 Scannable impression coping was secured to implant. A, Scannable impression coping. B, Facial view. C, Occlusal View.

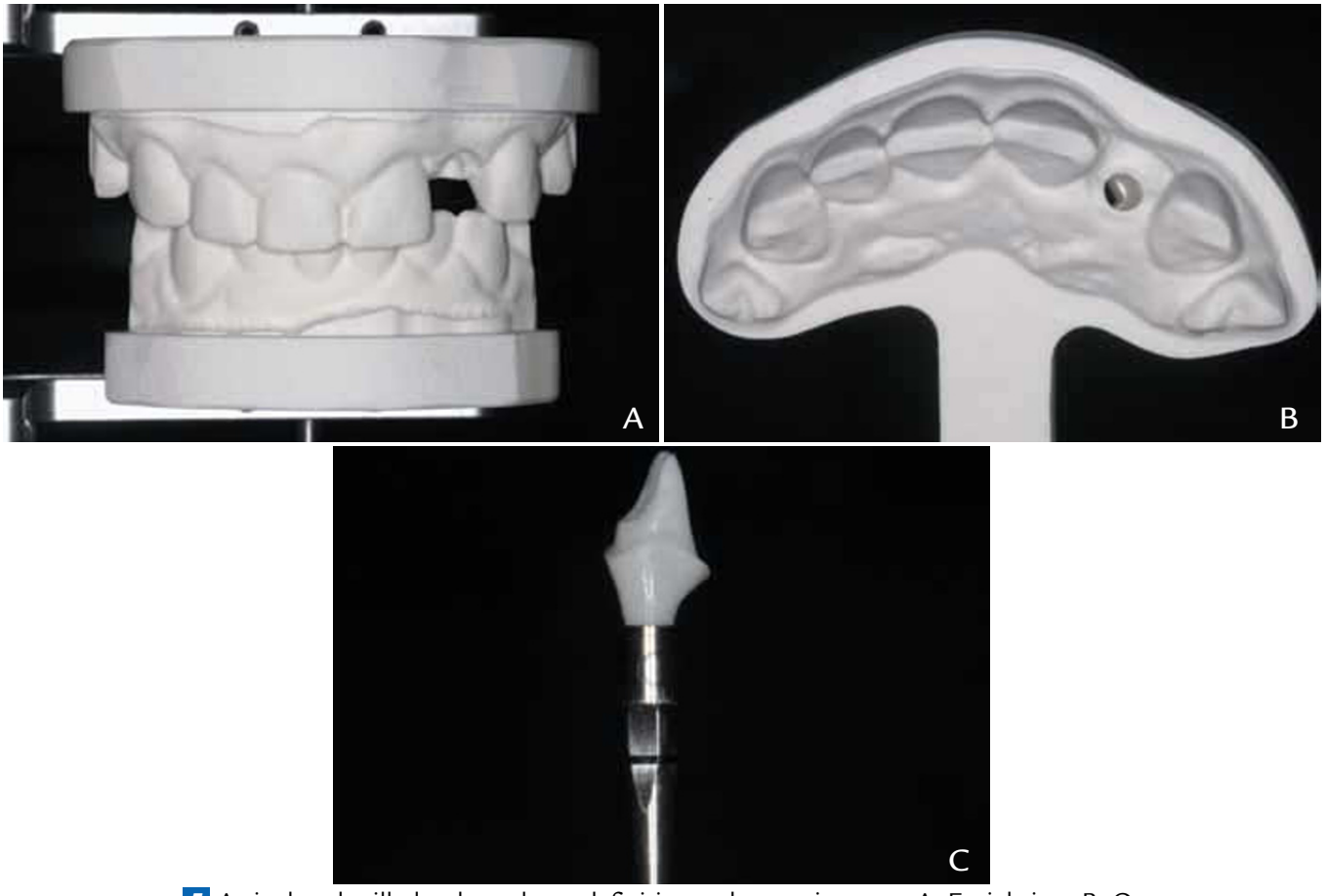


3 Digital analog of definitive and opposing cast. A, Facial view. B, Occlusal view.

tive polyurethane cast fabricated with a subtractive milling process (Cadent iTero; Cadent Ltd).[8] By combining the intraoral digital impression system (Cadent iTero; Cadent Ltd) with the scannable impression coping (Scan body; Straumann USA, Andover, Mass), an implant level impression can be made and the scanned data transmitted electronically to a modeling center and dental laboratory for the fabrication of a milled definitive polyurethane cast and customized anatomic abutment. Although more clinical studies are needed to evaluate the accuracy of a digital implant level impression made with a scannable impression coping, a preliminary in vitro study demonstrated that, for the operator, digital implant impressions were determined to be less difficult and more effective than the conventional impression technique.[9] This article describes a treatment protocol for using a scannable impression coping and digital intraoral scanner to fabricate a milled definitive polyurethane cast, customized anatomic abutment, and zirconia restoration in the esthetic zone.



4 Design of customized anatomic zirconia abutment. A, Facial view. B, Occlusal view.



5 Articulated milled polyurethane definitive and opposing cast. A, Facial view. B, Occlusal view. C, Customized anatomic zirconia abutment and implant analog assembly.

TECHNIQUE

1. Thoroughly examine the function, esthetics, and phonetics of the existing implant-supported interim restorations. Make clinical photographs to supply additional information and communicate with the dental laboratory technician as to the future definitive restoration (Fig. 1).

2. Remove the single-component resin sealing material (Fermit; Ivoclar Vivadent, Amherst, NY) with a high-speed diamond rotary instrument (Fine Diamonds, Round End; Brasseler USA, Savannah, Ga). Loosen the interim restoration with the corresponding screwdriver (SCS Screwdriver; Straumann USA) and remove it from the mouth.

3. Secure the scannable impression coping (Fig. 2A-2C) to the implant with the corresponding screwdriver (SCS Screwdriver; Straumann USA) and torque control device (Torque control device and Ratchet; Straumann USA) with 10 Ncm of torque.

4. Make the impressions (definitive impression, and the impression

for opposing arch) and an occlusal record registration with an intraoral digital scanner (Cadent iTero; Cadent Ltd) according to the guide instructions. Approve the digital impression and forward the scan data to the manufacturer (Cadent iTero; Cadent Ltd) for further modeling.

5. Download the processed virtual analog data of the definitive cast from the manufacturer's internet server in the dental laboratory. Communicate the digital screen images of the digital analog of the definitive cast to the dental laboratory electronically, and approve the milled definitive polyurethane cast fabrication (Fig. 3A, 3B).

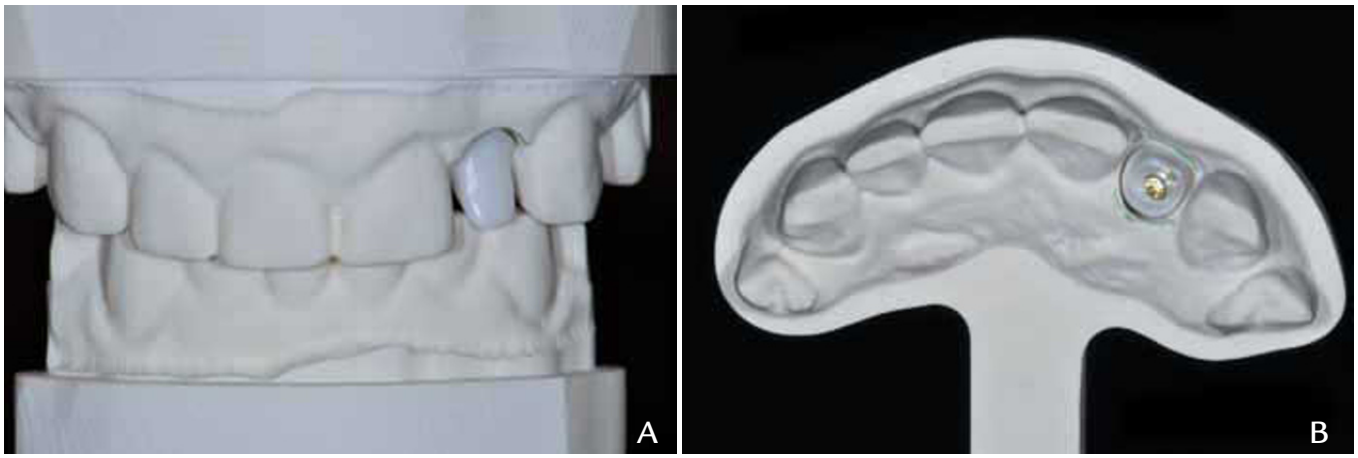
6. In the dental laboratory, design the customized anatomic zirconia abutment with a 1-mm subgingival margin while the milled definitive cast is being fabricated to shorten the production time for the dental laboratory work. Communicate the screen images of abutment design electronically to the dental laboratory and provide feedback to the dental laboratory technician concerning any necessary changes in design (Fig. 4A, 4B). Transmit the approved abutment design to the manufacturer (Zerion, zirconium dioxide ceramic; Straumann USA) for fabrication of the abutment.

7. Articulate the milled polyurethane definitive cast and opposing cast in a specifically designed articulator (Itero Articulator; Cadent Ltd) (Fig. 5A, 5B). Assemble the customized anatomic zirconia abutment and corresponding implant analog (Reposition analog for Itero system; Straumann USA) (Fig. 5C).

8. Mark the periimplant soft tissue margin on the definitive cast before the adjustment to prevent unnecessary modification of the milled definitive polyurethane cast. Adjust the definitive cast at the areas below the periimplant soft tissue margin to remove any interference that may prevent the analog and customized anatomic zirconia abutment assembly seating completely in the cast (Fig. 6A, 6B).

9. Scan the definitive cast and customized anatomic zirconia abutment assembly for the zirconia substructure fabrication (Zerion, zirconium dioxide ceramic; Straumann USA). Complete the definitive crown fabrication with low-fusing nanofluorapatite glass-ceramic as veneering porcelain (IPS e.max Ceram; Ivoclar Vivadent) (Fig. 7A, 7B).

10. Remove the interim restoration and secure the customized anatomic zirconia abutment (Zerion, zirconium dioxide ceramic; Straumann USA) to



6 Milled polyurethane definitive restoration adjusted at periimplant soft tissue area with customized anatomic zirconia abutment and implant analog assembly in place. A, Facial view. B, Occlusal view.

7 Completed definitive zirconia restoration with customized anatomic zirconia abutment.

8 Definitive crown and customized anatomic zirconia abutment. A, Abutment. B, Definitive crown.

the implant with 35 Ncm of torque. Verify the marginal adaptation and occlusion for satisfactory clinical outcomes. Adjust the definitive restoration, if necessary, with suitable grinding instruments (LD13M LD grinder pink medium; Brasseler USA) with low speed and light pressure.

11. Apply zirconia primer on the customized anatomic abutment and the intaglio surface of the zirconia crown with a microbrush following the manufacture's recommendation. Lute the restoration with a dual-polymerizing resin cement (Multilink Implant; Ivoclar Vivadent) (Fig. 8).

SUMMARY

This report described a digital pathway for making an implant impression with a scannable impression coping and intraoral digital scanner and fabricating the customized zirconia abutment and crown with the CAD/CAM process in the esthetic zone. This technique provides an easy and less time-consuming treatment workflow because a customized anatomic abutment can be designed directly from the virtual analog data of the definitive cast while the milled definitive polyurethane cast is in production.

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