Dental implants were introduced for the treatment of patients with complete edentulism.\(^1\) However, soon after their introduction, dental implants became a valid treatment for patients with partial edentulism.\(^2,3\) For these individuals, providing interim restorations is important because these restorations help confirm the diagnostic design,\(^4,5\) esthetics,\(^4-8\) and contours,\(^4-8\) which can be replicated in the definitive prosthesis.\(^9-11\) The healing response around the abutments can be evaluated,\(^8,10-12\) and the soft tissue around the fixtures can heal according to the contours of the definitive prosthesis.\(^6,10,11,13,14\) Interim restorations also allow the osseointegration of the fixture to be observed.\(^14\)

The conventional protocol indicated that a healing period of 3 to 6 months is recommended to achieve osseointegration before loading the implants with a prosthesis.\(^15\) Immediate loading is a technique for eliminating the 3- to 6-month healing period. The technique has been described in combination with mandibular bar-retained overdentures,\(^16-18\) complete arch implant-supported screw-retained prostheses,\(^19-23\) and with partial edentulism.\(^24-32\) Regardless of the technique, various methods have been proposed and used to transfer soft tissue architecture to the laboratory so the definitive prosthesis can be fabricated in accordance with the acquired soft tissue morphology. The purpose of the current technique report was to describe a method for the immediate loading of single root form implants with a computer-assisted design and computer-assisted manufacturing (CAD/CAM) interim restoration.

**ABSTRACT**

A technique is described in which a single interim abutment and crown were fabricated in advance and placed the day of dental implant surgery. The contours of the interim crown were identical to the contours of a tentatively designed definitive prosthesis and allowed the tissue to heal and obtain contours that accommodated the contours of the definitive prosthesis. After osseointegration was established, a definitive impression was made with a custom computer-assisted design and computer-assisted manufacturing impression coping. The definitive prosthesis then was fabricated. (J Prosthet Dent 2015;113:91-95)

**TECHNIQUE**

1. Evaluate the tissue around the edentulous area for signs or symptoms of pathosis (Fig. 1). Make complete arch preliminary impressions preoperatively from the patient’s maxillary and mandibular arches by using polyvinyl siloxane impression material (Silgimix; Sultan Healthcare). Make an interocclusal record with polyvinyl siloxane occlusal registration material (Exabite II NSD; GC America Inc) at the maximum intercuspation position. In addition, after providing local anesthesia, map the alveolar ridge by using an endodontic file with a rubber stop.\(^37\) With this technique, the thickness of the soft tissue is measured around the area of the prospective implant surgery.

2. Scan the impressions (D700 scanner; 3Shape) and simulate the definitive prosthesis with the provided software. The computer software, which is incorporated into the scanner, allows the size and shape of each component to be designed digitally by using precise measurements. With the contours of the definitive prosthesis as reference, fabricate a custom interim abutment from a polymethyl methacrylate (PMMA) block with a milling
A computer-designed interim crown can be milled from a PMMA block according to the computer-designed contours of the definitive prosthesis (Fig. 2). Design the interim crown to be slightly in infraocclusion and to provide a relief space between the interim abutment and the crown. Position the margins of the interim abutment according to the thickness of the soft tissue measured during ridge mapping. The goal is to position the margins 0.5 mm subgingivally on the facial aspect of the restoration for good esthetics so that the interim abutment-crown transition line is not visible.

Fabricate the interim abutment and crown in the laboratory before implant surgery is scheduled.

3. Fabricate a CAD/CAM custom impression coping from a PMMA block (Fig. 3). The CAD/CAM interim crown can be evaluated on the diagnostic stone cast to confirm ideal contours, contact areas, and esthetics (Fig. 4).

4. Place the dental implant with the patient under local anesthesia and with the aid of a surgical stent and copious saline solution irrigation. For this patient, a threaded, root form, resorbable, blast media surfaced dental implant was chosen (Inclusive; Glidwell Corp), and full thickness labial and lingual flaps were reflected (Fig. 4).

5. Confirm adequate primary stability (40 Ncm) and hand tighten the CAD/CAM interim abutment on the implant. Place the polyvinyl siloxane impression material (Exafast NDS; GC America Inc) into the occlusal access hole.

6. Evaluate implant stability at the day of surgery with a Periotest device (Periotest; Siemens). For this patient, this was recorded as −1, consistent with adequate implant stability.

7. Reline the CAD/CAM interim crown with autopolymerized acrylic resin (Alike; GC America Inc) after
applying a separating medium (Al Cote; Dentsply Intl) to the CAD/CAM interim abutment. The space between the CAD/CAM interim abutment and the crown was provided to compensate for inaccuracies in the implant position during surgery.

8. Trim the excess autopolymerized acrylic resin material and confirm occlusal clearance at approximately 50 μm with 4 layers of shim stock (Occlusal registration strips; The Artus Corp). Evaluate the proximal contacts with a single layer of the shim stock.

9. Cement the CAD/CAM interim crown with non-eugenol interim cement (TempBond; Kerr Corp). After removing the excess cement, suture the tissue with polytetrafluoroethylene white monofilament nonabsorbable suture (Cytoplast; Osteogenics Biomedical Inc) (Fig. 5).

10. Three months after surgery (Fig. 6), evaluate the implant for stability with the Periotest device. For this patient, the Periotest measured -2, whereas radiographic evaluation revealed no pathosis, which thereby confirmed successful osseointegration of the dental implant. No probing greater than 4 mm was detected around the implant.

11. Remove the CAD/CAM interim abutment and crown, and evaluate the tissue (Fig. 7). The tissue seemed to have obtained contours compatible with the contours of the prospective definitive prosthesis. Hand tighten the CAD/CAM custom impression coping and make a definitive impression with polyvinyl siloxane impression material (Exafast NDS).

12. Fabricate a CAD/CAM zirconia abutment bonded to a titanium insert and tighten it to 35 Ncm. Place polyvinyl siloxane impression material into the occlusal access hole. Also, make a cementable zirconia crown with similar contours to the interim restoration with data stored in the software.

13. Confirm the occlusion, proximal contacts, and esthetics, and cement the crown with resin modified glass ionomer cement (Rely-X Luting Cement; 3M ESPE) (Fig. 8).
DISCUSSION

Placement of an interim restoration on the day of implant surgery offers esthetic, psychological, and functional advantages compared with the use of an interim removable prosthesis. It also eliminates second-stage surgery, which reduces patient discomfort and additional procedural cost. The soft tissue around the implants can heal according to the contours of the interim restoration. However, if the interim restoration is placed after the implant becomes osseointegrated, then an additional healing period of 3 to 8 weeks is needed for soft tissue healing. The protocol presented eliminated the period necessary for soft tissue healing and contouring because healing occurred concurrently with the implant.

In the described technique, a CAD/CAM impression coping was used to transfer soft tissue anatomy specimens to the laboratory before fabricating the definitive prosthesis. Others have suggested the use of the interim prosthesis while making the impression, and fabricate a custom impression coping by placing autopolymerized acrylic resin around the impression coping or use intraoral scanners. To the author’s best knowledge, no consensus exists as to which technique better transfers soft tissue architecture in the laboratory before the fabrication of a definitive prosthesis. The described technique may provide reduced chair time by having the custom impression coping fabricated in advance before implant surgery.

With the described technique, the operator also has the option of fabricating a screw-retained interim restoration, which would entail the use of acrylic resin material between the CAD/CAM interim abutment and the crown after implant placement. In this situation, no separating medium would be placed between the interim abutment and the crown. After removing the excess acrylic resin material, the operator could open an occlusal access hole on the interim restoration, which transforms the interim prosthesis into a screw-retained restoration. The literature regarding complications of interim prosthesis placed on dental implants on the day of surgery is scarce. evaluated 17 consecutively treated root form dental implants of patients who received interim restoration on the day of surgery. In their study, 46% of the cement-retained interim crowns fractured and 15% experienced debonding of the acrylic resin veneer material. Therefore, patients need to be aware of these complications, and a thorough informed consent should include the relatively high possibility of those occurring.

SUMMARY

The described technique offers an alternative method for fabricating interim restorations on dental implants. A prospective clinical study is needed to validate the use of the described technique.

REFERENCES

30. Kan JY, Rungcharassaeng K, Lozada J. Immediate placement and provisiona- 


31. Balshi TJ, Wolfinger GJ, Wulc D, Balshi SF. A prospective analysis of 
 immediate provisionalization of single implants. J Prosthodont 2011; 
 20:10-5.

32. Aboud M, Koeck B, Stark H, Wahl G, Paillon R. Immediate loading of 
 single-tooth implants in the posterior region. Int J Oral Maxillofac Implants 

33. Bruno V, O’Sullivan D, Badino M, Catapano S. Preserving soft tissue after 
 placing implants in fresh extraction sockets in the maxillary esthetic zone and 
 a prosthetic template for interim crown fabrication: a prospective study. 

34. Noh K, Kwon KR, Kim HS, Kim DS, Pae A. Accurate transfer of soft tissue 
 morphology with interim prosthesis to definitive cast. J Prosthets Dent 
 2014;111:159-62.

35. Lin WS, Harris BF, Morton D. Use of implant-supported interim restorations 
 to transfer perimplant soft tissue profiles to a milled polyurethane definitive 

36. Man Y, Qu Y, Dam HG, Gong P. An alternative technique for the accurate 

37. Koutouzis T, Neva R, Nonhoff J, Lundgren T. Placement of implants with 
 platform-switched Morse taper connections with the implant-abutment 
 interface at different levels in relation to the alveolar crest: a short-term 
 (1-year) randomized prospective controlled clinical trial. Int J Oral Maxillofac 

38. Olive J, Aparicio C. Periotest method as a measure of osseointegrated oral 

 clinical diagnosis of bone apposition towards implants. Int J Oral Maxillofac 

40. Elias J, Brunski JB, Scarton HA. A dynamic modal testing technique for 
 noninvasive assessment of bone-dental implant interfaces. Int J Oral Max- 
 illofac Implants 1996;11:728-34.

41. Kim JS, Raimondi AK, Flinn BD, Rubenstein JE, Chung KH, Mancl LA. 
 In vitro assessment of three types of zirconia implant abutments under static 

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