

A Technique to Fabricate an Interim Implant-Supported Fixed Complete Denture for Immediate Loading

Oguz Ozan, DDS, PhD¹

Tolga Pekperdahci, DDS, PhD²

Doruk Kocyigit, DDS, PhD³

Burak Yilmaz, DDS, PhD^{4*}

Converting an acrylic resin removable complete prosthesis into a fixed implant-supported prosthesis to immediately load the implants can be a challenging procedure. Using acrylic resin to secure titanium interim copings intraorally may be a difficult task, and any process to facilitate this procedure may be advantageous for the clinician and the patient. This report describes a technique for facilitating the fabrication of an interim immediately loaded implant-supported fixed complete prosthesis. This technique and the materials used enabled the efficient fabrication and delivery of the prosthesis with an appropriate soft-tissue surface and acrylic resin thickness without irritating newly sutured soft tissues.

Key Words: immediate loading, conversion, interim prosthesis

INTRODUCTION

The fabrication and immediate delivery of complete arch prostheses supported by 4 implants has become a popular clinical option.^{1,2} Immediate loading enables the delivery of a fixed prosthesis if adequate implant stability is achieved during placement. Immediately after implant placement, an existing or immediate prosthesis can be adapted by fixing it to titanium copings, followed by laboratory adjustments and finishing, producing an interim immediately loaded implant-supported fixed complete denture (ISFCD).^{3,4} As these procedures are performed immediately after implant placement, patient cooperation may become a problem on the day of surgery and denture placement because of fatigue. Therefore, a rapid and efficient technique for the fabrication and delivery of the prosthesis is beneficial. In addition, postoperative bleeding and protecting the mucosa from prosthetic materials may be challenging when fixing the denture to the titanium copings. For the procedures to be completed in a precise, safe, and time-efficient manner, a rigid pickup material that polymerizes rapidly and does not stick on the acrylic resin when picking up the titanium copings is recommended.

This report describes a technique for fabricating an

immediately loaded ISFCD in a time-efficient and reliable manner on 4 implants (Figure 1a). A rapidly polymerizing pickup material is used to achieve a rigid connection between the acrylic resin denture and the titanium copings. This material also enables safe registration of the newly sutured soft tissues to obtain an optimal prosthesis–soft tissue relationship.

TECHNIQUE

1. Inject a polyvinyl siloxane (PVS) occlusal registration material (Color Bite Rock, Zhermack) into the existing or immediately fabricated complete denture to reline the denture and determine the locations of the implants (Replace Conical, Nobel Biocare) in the complete denture (Figure 1b). Seat the denture and make sure the patient occludes correctly. Once the material polymerizes, remove the denture. Drill holes in the relined complete denture with an acrylic bur (Euro Carbide Bur, Dedeco) at sites corresponding to the implant positions as recorded by the PVS (Figure 2).
2. Remove the healing caps (Nobel Biocare) and tighten the titanium copings on multiunit abutments (Nobel Biocare; Figure 3). Evaluate the path of denture insertion. Once the denture seats passively, make sure the occlusion and the occlusal vertical dimension are not altered. If the titanium copings interfere with the occlusion, shorten them by using acrylic resin burs.
3. Remove the denture and drill holes with acrylic resin burs (Euro Carbide Bur, Dedeco) in the buccal flanges where the PVS material will be injected into the titanium copings during the pickup procedures.
4. Replace the relined denture in the mouth, and once it is seated passively and occlusion is confirmed (Figure 4a), inject the same fast-polymerizing PVS (Color Bite Rock, Zhermack) material used for relining through the holes and

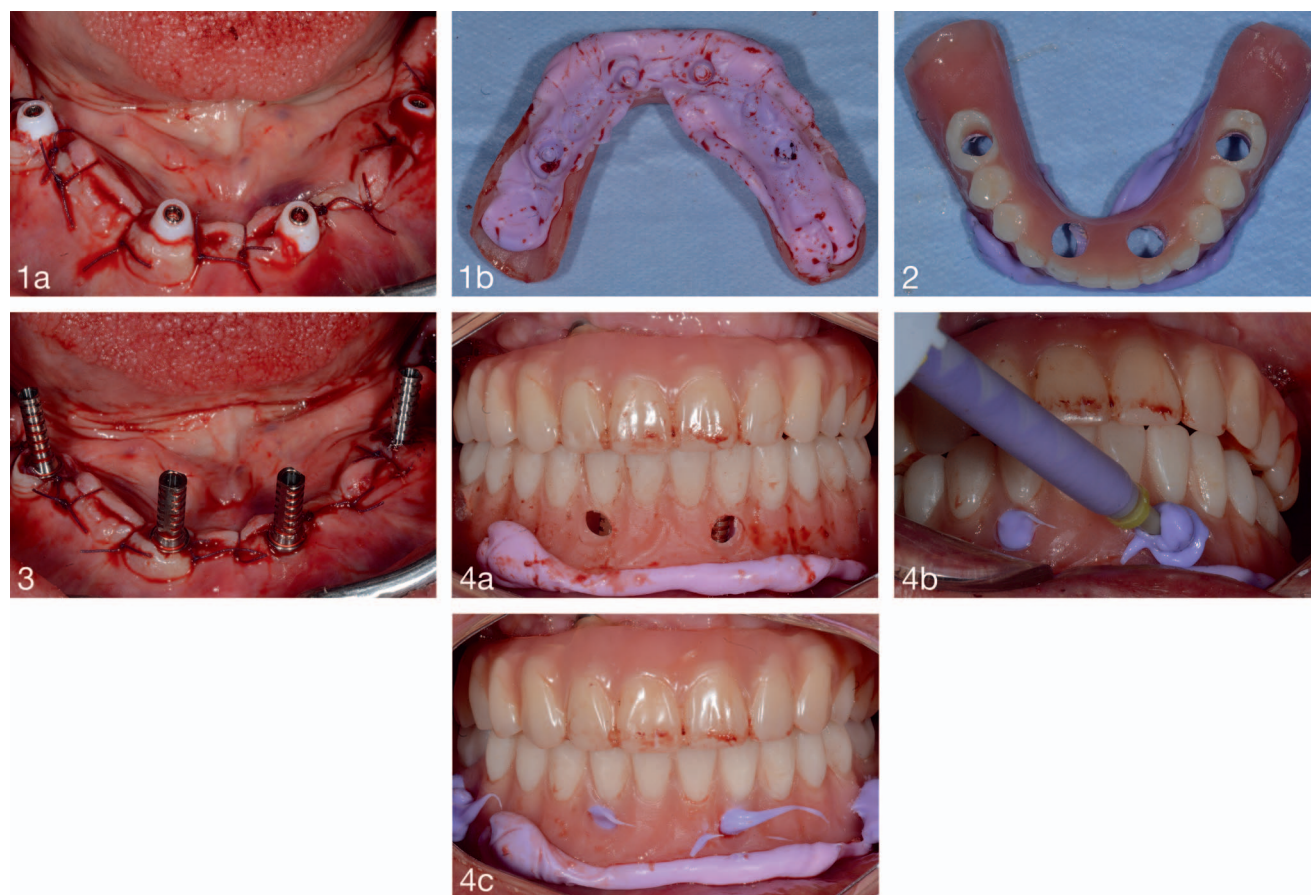
¹ Department of Prosthodontics, Faculty of Dentistry, Near East University, Lefkosa, Turkey.

² Private practice, Capa, Istanbul, Turkey.

³ Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Kirikkale University, Kirikkale, Turkey.

⁴ Department of Gerodontology and Reconstructive Dentistry and Department of Restorative, Preventive, and Pediatric Dentistry, University of Bern, School of Dentistry, Bern, Switzerland; Division of Restorative and Prosthetic Dentistry, The Ohio State University College of Dentistry, Columbus, Ohio.

* Corresponding author, e-mail: yilmaz.16@osu.edu
<https://doi.org/10.1563/aaid-joi-D-19-00374>



FIGURES 1–4. **FIGURE 1.** (a) Intraoral view of implants immediately after placement. (b) Initial polyvinyl siloxane impression. **FIGURE 2.** Drilled holes for passive fit of denture when titanium copings are placed onto abutments. **FIGURE 3.** Titanium copings tightened onto abutments. **FIGURE 4.** (a) Holes drilled on the buccal flange in the location of the abutments. (b) Polyvinyl siloxane being injected through the holes. (c) Material setting intraorally in regular occlusion.

let it polymerize as the patient continues to occlude with their normal occlusal force (Figure 4b and c).

5. Once the PVS has polymerized, unscrew the titanium copings and remove the denture. Make sure the copings are secured in the PVS (Figure 5a and b). Carefully screw the multiunit abutment analogs onto the copings (Figure 5c). Pour type III stone (Micro Stone, Whip Mix Corp) into the impression (Figure 5d).
6. Once the stone sets, mount the complete denture with the stone on a reline jig with mounting stone (Figure 6a and b). The reline jig has upper and lower members and ensures proper seating of the denture when resealed on Type III stone during the reline procedure. The mounting stone is first poured on the lower member, and the denture with stone is positioned on the mounting stone with the teeth facing the mounting stone. Then, the upper member of the jig is screwed onto the lower member and secured to the cast with the denture with mounting stone. Once the mounting stone sets, loosen the upper member and remove it from the lower member. The upper member now has the cast and the denture secured to it. Remove the denture from the stone and the PVS from the denture. Then, lubricate the stone with petroleum jelly, making sure the jelly does not contact the copings. Pack cotton pellets

into the screw access channels of the copings to prevent acrylic resin flow into the screw channels (Figure 6c).

7. To pick up the copings in the denture, use autopolymerizing acrylic resin (Repair Material, Dentsply Sirona) in the intaglio surface of the denture and on the ridges of the Type III stone (Figure 6d). Be sure to have sufficient acrylic resin around the copings when the denture is seated on the cast, and replace the denture on the upper member of the reline jig, orienting the denture in its original position by using the traces of the denture teeth on the mounting stone (Figure 6e). Tighten the screws of the upper member of the reline jig and secure the denture in its original location with resin. Remove excess resin with a sharp laboratory knife.
8. Once the resin polymerizes, loosen the screws of the reline jig and remove the upper member with cast and denture. Unscrew the screws of the titanium copings to separate the denture from the stone (Figure 6f). Carefully remove the palatal, lingual, labial, and buccal flanges to the desired length to remove any contact with soft tissues and relieve the pressure to improve the denture's cleanability. Add acrylic resin in the denture where necessary to fill any voids, especially around the copings, and allow the resin to polymerize. Adjust irregularities with acrylic resin burs.

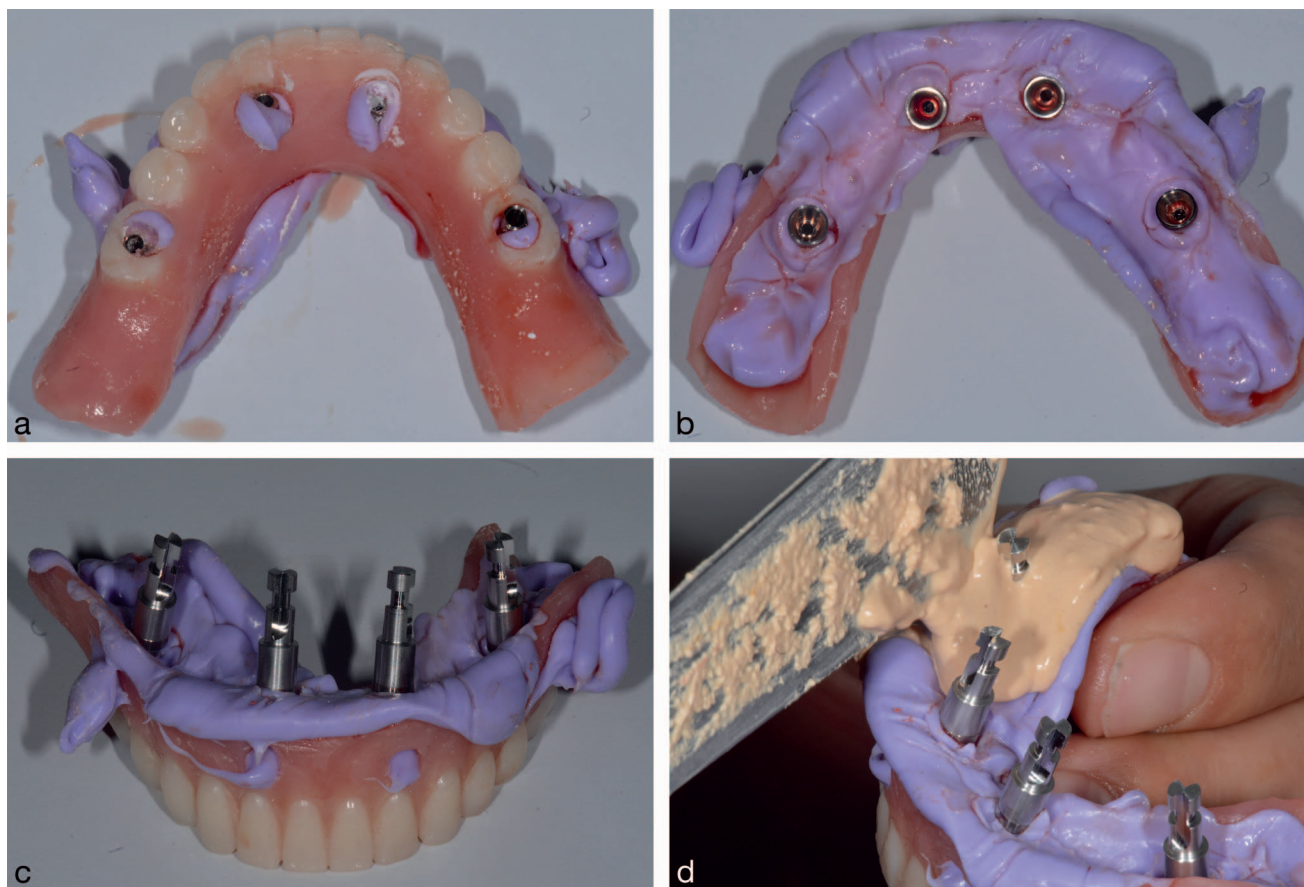


FIGURE 5. (a, b) Copings picked up with polyvinyl siloxane in denture. (c) Analogs screwed onto copings. (d) Stone being poured.

9. Polish the denture's soft-tissue surfaces (Figure 7a and b). Remove the healing caps and seat the ISFCD onto the abutments. Evaluate the occlusion and make any adjustments using rotary instruments and burs. Polish the adjusted surfaces with a mixture of pumice and water.
10. Replace the denture on multiunit abutments, tighten the prosthetic screws to the recommended torque value (15 Ncm), and fill in the screw access channels with polytetrafluoroethylene (Teflon) and a composite resin (Herculite, Kerr Corp; Figure 8a and b). Give the patient the postinsertion recommendations.

DISCUSSION

To expedite the fabrication process of the immediately loaded ISFCD and improve the precision, the material used to attach the copings to the acrylic resin during pickup should be fast set, firm, and easy to remove during the laboratory procedures. Acrylic resin is commonly used directly intraorally to fix titanium copings during immediate fixed complete denture fabrication.⁴ However, autopolymerizing acrylic resin generates heat during polymerization and may irritate soft tissues when used directly intraorally. The resin may flow around the dental dam gingival to the abutments, and the denture may lock because of the resin flow into the

undercuts.³ In addition, if the acrylic resin flows into the screw access holes, it may be difficult to remove. In addition, if removal of the denture is necessary, it may be difficult to remove the acrylic resin from the multi-unit abutments and titanium copings, and the abutments and titanium copings may be damaged. Also, the denture intaglio surface and soft-tissue relationship cannot be properly controlled when the denture is trimmed and adjusted extraorally without a cast. As the resin is directly applied to the soft tissues, and as it is difficult to control blood and saliva immediately after surgery, these fluids may negatively affect the polymerization of the acrylic resin and decrease its strength.

However, the occlusal registration PVS polymerizes rapidly, and because it is approved for intraoral use, it is safe to use on soft tissues, unlike acrylic resin. Because the PVS has some elasticity, if it flows into the undercuts, the removal of the denture is straightforward and causes less trauma to the abutments and copings compared with when acrylic resin is used. Likewise, if the PVS flows into the screw-access channels, its removal is easier than the removal of acrylic resin in the channel. The soft tissue is replicated with the initial reline impression for a favorable denture–soft tissue relationship; this helps increase the acrylic resin thickness, improving adaptation of the polymerized acrylic resin to the soft tissues. The PVS does not chemically bond with the acrylic resin; therefore, its removal from the intaglio surface is straightforward and rapid.

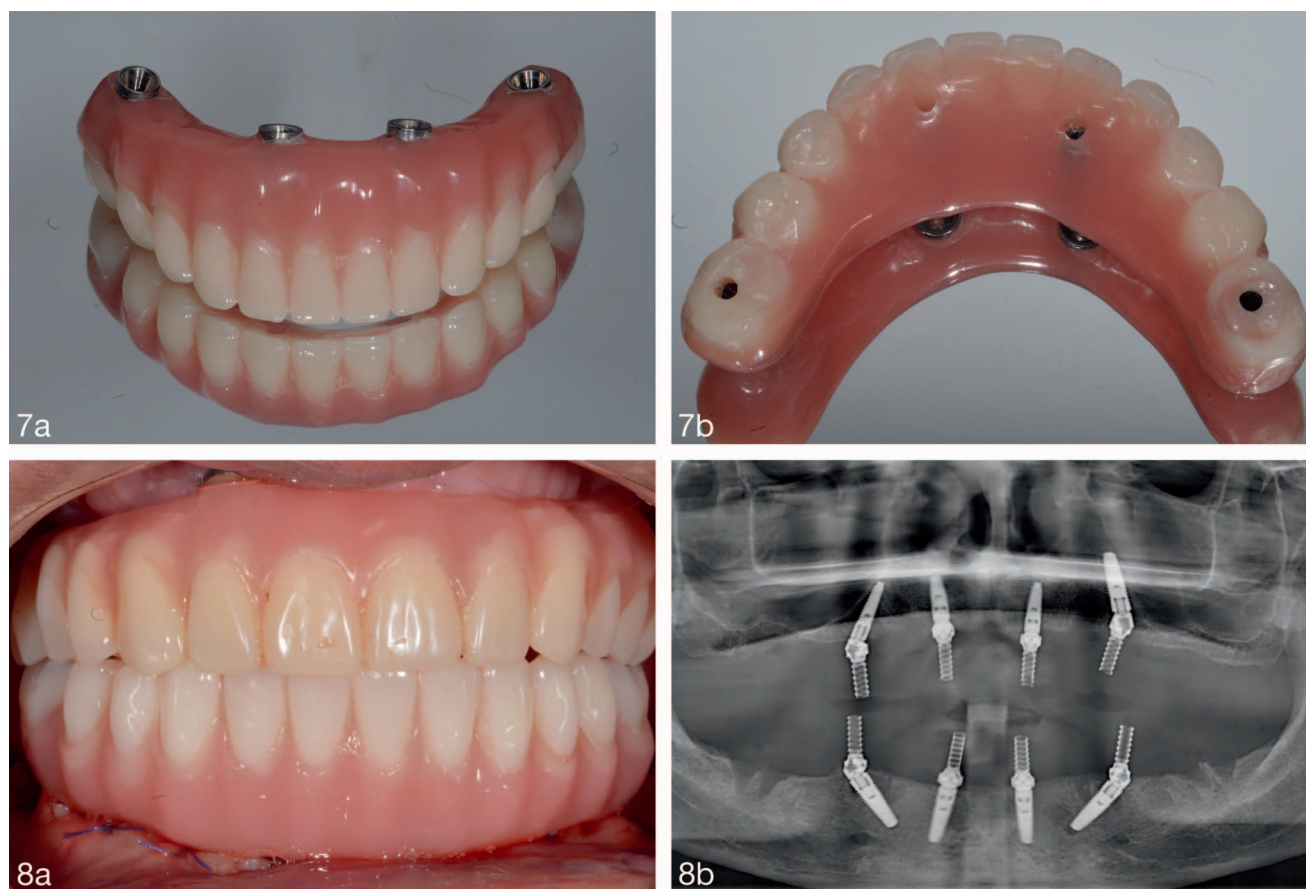
When the acrylic resin is used directly intraorally, the



FIGURE 6. (a, b) Denture mounted on reline jig; the denture with its cast secured to the upper member of the jig. (b) Stone isolated with petroleum jelly. (d) Acrylic resin applied on the cast. (e) Relined denture placed on the reline jig and jig tightened for the period of autopolymerization. (f) Relined denture removed from cast.

occlusion may be affected because the denture may move due as its adaptation to the soft-tissues changes as the tissues are newly sutured. However, in the presented technique, the initial reline impression that recorded the soft tissues and relined the denture results in a stabilized denture when the patient occludes during coping pickup minimized the need for occlusal

adjustment. With this technique, the overall fabrication time for the immediate fixed complete denture is shorter. The holes are drilled where the abutments are located, allowing the PVS to be injected around the copings for improved flow and seal around the coping. The rigidity of the PVS (Shore A hardness of 95) secures the copings in the complete denture, ensuring accuracy



FIGURES 7 AND 8. **FIGURE 7.** (a) Polished mandibular fixed complete denture facial view. (b) Lingual view. **FIGURE 8.** (a) Mandibular denture delivered on the day of surgery. (b) Panoramic radiograph day of delivery.

when transferring the implant positions. However, as the PVS material polymerizes quickly, the denture should be rapidly inserted in the mouth to avoid altering the occlusal vertical dimension.

Hashemzadeh et al³ described a similar technique with different materials and without the buccal holes for injecting the pickup material, which may not enable the secure pickup of titanium copings. However, in the current technique, because the pickup material is injected through the holes in the area of the copings, the copings may be picked up more securely without any displacement, aiding in an accurate impression.

A reline jig was used to secure the denture when the acrylic resin was applied and polymerized.^{3,5} This jig enables the proper seating of the denture on the generated cast after the PVS material is removed from the intaglio surface. The proper seating of the denture enables the proper orientation of the denture in relation to the cast. In addition, because the acrylic resin polymerizes in the denture, which is secured in the jig, incomplete seating is prevented, and the resin polymerizes when the denture is correctly positioned, preventing changes in the vertical dimension of occlusion.

Recent techniques have reported the use of digital technologies and computer-aided design–computer-aided manufacturing (CAD-CAM) to load the implants immediately.^{6–9} These techniques enable the precise virtual planning of implant placement and CAM of surgical guides as well as the

immediate delivery of the prosthesis. One of these CAD-CAM techniques, for instance, enables the removal of existing teeth, the preplanning of the amount of bone removal where the extraction sockets are, the placing of the implants, and the delivery of the immediate prostheses according to the virtual planning through cone-beam computerized tomography (CBCT). With this and similar techniques, implants can be placed in a controlled manner through CBCT-generated guides, and interim prostheses can be planned according to the implant positions and locations to allow for optimal prosthesis orientation during surgery. This improves the ability to reach the targeted occlusion and minimize the size of the implant access holes in the interim dentures, improving its strength. However, these techniques require new technological equipment, software, adequate training and experience, and an increase in the overall cost of treatment. The presented technique, however, can be implemented without the need for any advanced digital and CAD-CAM equipment, software, or experience with digital technologies. Clinicians can use conventional dental materials to deliver fixed dentures immediately with the presented technique, which makes the technique cost-effective. However, the presented technique has limitations in terms of the precision of implant placement and the lack of precise virtual planning compared with recent CAD-CAM–supported techniques. The holes in the prostheses

need to be opened during implant placement surgery, which may increase chairside time.

SUMMARY

This report describes a technique for an immediately loaded 4-implant-supported prosthesis in an edentulous arch by using a fixed complete denture. This time-efficient technique protects the soft tissues and allows the fixed complete denture conversion to be completed more quickly. These advantages enhance patient and clinician comfort during the day of implant placement and denture delivery.

ABBREVIATIONS

CAD-CAM: computer-aided design–computer-aided manufacturing

CBCT: cone-beam computerized tomography

ISFCD: implant-supported fixed complete dentures

PVS: polyvinyl siloxane

NOTE

The authors declare no conflict of interest.

REFERENCES

1. Mericske-Stern R, Worni A. Optimal number of oral implants for fixed reconstructions: a review of the literature. *Eur J Oral Implantol*. 2014;7:133–153.
2. Penarrocha-Diago M, Penarrocha-Diago M, Zaragozi-Alonso R, Soto-Penaloza D, Meeting on Behalf of the Ticare Consensus. Consensus statements and clinical recommendations on treatment indications, surgical procedures, prosthetic protocols and complications following All-On-4 standard treatment. 9th Mozo-Grau Ticare Conference in Quintanilla, Spain. *J Clin Exp Dent*. 2017;1:712–715.
3. Hashemzadeh S, Yilmaz B, Zugaro F, McGlumphy E. An alternative conversion technique for fabricating an interim fixed implant-supported complete arch prosthesis. *J Prosthet Dent*. 2016;116:647–651.
4. Balshi TJ, Wolfinger GJ. Conversion prosthesis: a transitional fixed implant-supported prosthesis for an edentulous arch—a technical note. *Int J Oral Maxillofac Implants*. 1996;11:106–111.
5. Shannon JL. Use of the remount jig as an aid in relining upper dentures. *J Prosthet Dent*. 1975;34:393–396.
6. Oh JH, An X, Jeong SM, Choi BH. A digital technique for fabricating an interim implant-supported fixed prosthesis immediately after implant placement in patients with complete edentulism. *J Prosthet Dent*. 2019;121:26–31.
7. Drago C, del Castillo R, Peterson T. Immediate occlusal loading in edentulous jaws, CT-guided surgery and fixed provisional prosthesis: a maxillary arch clinical report. *J Prosthodont*. 2011;20:209–217.
8. Ovchinnik V, Karatas B, Yilmaz B, McGlumphy EA. Fabrication of an implant-supported fixed complete denture using multiple digital technologies for a patient with a perioral burn: a clinical report. *J Prosthet Dent*. 2018;120:161–167.
9. Ganz SD, Tawill I. Full-arch implant surgical and restorative considerations: utilizing a full template guidance technique. *Dent Today*. 2019;September;2–8