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An Alternative Approach in Fabrication of Fixed Complete Dentures Using a Duplicate Denture

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Abstract

The traditional prosthetic steps in the fabrication of a fixed complete denture after implant osseointegration include final impression, verification of implant positioning in the working cast, mounting of the working cast, and mock denture wax trial insertion prior to the laboratory fabrication of the metal substructure; however, in patient scenarios of immediate loading of implants, the interim conversion prosthesis can be used to advance from the final impression to the milling of the underlying framework in one appointment. Consistency in the initial wax trial insertion, radiographic guide, and intraoral positioning of the conversion prosthesis can result in a well-designed definitive prosthesis in less time with the use of the existing duplicate complete denture.

With the increasing popularity of immediate loading of dental implants in the edentulous mandible,[1–5] recent literature has focused on improving techniques for conversion of a denture into an interim implant-supported prosthesis.[6–8] Prefabricated full-arch mandibular and maxillary implant-supported interim prostheses can be fabricated in the laboratory at the desired occlusal vertical dimension (OVD) prior to the surgery and then inserted with accuracy to meet the functional and esthetic demands of both the patient and clinician. Compared to the traditional two-stage approach of first allowing the submerged implants to osseointegrate before attempting to load, the immediate restoration approach offers the patient superior comfort and function while implants osseointegrate.[9] Patients may not need to struggle with the challenges of wearing an immediate denture during the implant healing phase.

As the number of patients who select insertion of an immediate interim prosthesis following implant surgery increases, devising a technique to achieve insertion of the definitive prosthesis in less time using the existing transitional denture is desirable. The traditional prosthetic steps in the fabrication of a fixed complete denture after implant osseointegration include final impression, verification of implant location, mounting of working casts, and mock denture wax trial insertion prior to the laboratory fabrication of the alloy substructure. This process can take a minimum of three appointments but assures accurate fabrication of the underlying support structure. This article describes a alternative technique of advancing from the final impression to the milling of the underlying framework in one appointment using a duplicate of the existing fixed provisional denture.

Background

A 64-year-old white female patient presented for final fabrication of a mandibular fixed complete denture supported by five interforaminal implants (Osseospeed 4.0S × 13 mm; AstraTech, Waltham, MA). The patient's maxillary and mandibular teeth were extracted 1 year earlier, and immediate dentures were inserted. Six months postextraction, a new set of dentures was fabricated to best represent final prosthesis tooth position. The maxillary denture served as the definitive prosthesis. The new mandibular denture was duplicated in acrylic resin (teeth: 30% barium/70% Orthodontic Resin; soft tissue: 10% barium/90% Orthodontic Resin; Dentsply, York, PA) to serve as a radiographic marker for prosthesis position relative to the underlying bone. A medical grade computed tomograph (CT)

Figure 1 Maxillary complete denture opposing a interim mandibular fixed complete denture on the day of surgical implant placement.

Figure 2 Definitive mandibular denture duplicated to fabricate radiographic guide.

Figure 3 OVD with maxillary complete denture and mandibular conversion prosthesis in maximum intercuspation.

Figure 4 Radiographic guide luted intraorally to temporary abutments using autopolymerizing acrylic resin.

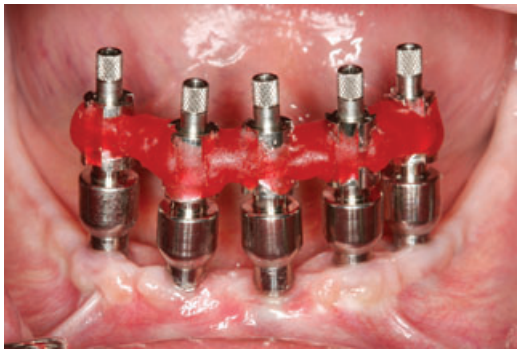

Figure 5 Autopolymerizing acrylic resin and impression copings used to register implant positions intraorally for verification of position on the working cast.

Figure 6 Mounted maxillary diagnostic cast opposing mandibular final impression using the luted radiographic guide.

was made with this radiographic guide, and a bone-supported surgical guide (SurgiGuide; Materialise, Leuven, Belgium) was ordered after appropriate planning of implant placement using a 3D prosthesis and surgical planning software package (Facilitate; AstraTech).

Five mandibular interforaminal implants were surgically placed with the surgical guide following the manufacturer's protocol, and final implant insertion torques greater than 40 Ncm were achieved. Abutments (45° UniAbutments; AstraTech) were placed and torqued to the manufacturer's recommendation followed by placement of titanium temporary abutments (Temporary Cylinder Uni 45°; AstraTech). These temporary abutments were intraorally affixed to the mandibular complete denture with light-polymerized acrylic resin (GC Gradia Gum; GC America Inc, Alsip, IL), and the mandibular complete

denture prosthesis was adjusted to mimic a fixed complete denture (Fig 1). This prosthesis served as the interim conversion prosthesis until implant osseointergation was achieved.

After 4 months of healing, the conversion prosthesis and the implants were evaluated for osseointegration. The technique used for definitive mandibular fixed complete denture fabrication is described below.

Technique

1. Confirm that the radiographic guide fabricated for the CT scan is a duplicate of the existing conversion prosthesis and future definitive prosthesis (Fig 2). Verify functional and esthetic acceptability of tooth location in the conversion prosthesis and radiographic guide.
2. Record the patient's OVD according to the maxillary complete denture and mandibular conversion prosthesis in maximum intercuspation (Fig 3).
3. Remove the conversion prosthesis.
4. Make the final impression using abutment-level, open-tray impression copings (45° UniAbutment Pick-up Ø 4.3 mm), a custom tray, and medium and heavy-body poly(vinyl siloxane) (VPS) impression material (Extrude; Kerr Corporation, Orange, CA).
5. Attach abutment replicas (45° UniAbutment Replica; Astra Tech) to the impression copings and pour impression with soft tissue simulation material (Softissue Moulage; Kerr Corporation) and type IV dental stone (Fujirock EP; GC America Inc).
6. Relieve the intaglio surface of the radiographic guide over the implant sites. Keep the flanges and retromolar pad areas of the prosthesis intact.
7. Evaluate the radiographic guide intraorally. Ensure interferences in placement do not exist and that vertical dimension is consistent with the predetermined OVD measurement made in step 2.
8. Attach two roughened Ti temporary abutments (Temporary Cylinder Uni 45°) to two uniabutments (45° UniAbutments) and open an access area in the radiographic guide over those abutments.
9. Lute temporary abutments intraorally with autopolymerizing resin (Pattern Resin LC; GC America) to the radiographic guide (Fig 4). If instability is noted in the resulting radiographic guide, a third temporary abutment should be included for tripod prosthesis support.
10. Adjust occlusion on the radiographic guide as needed and obtain an interarch relationship using VPS occlusal registration material (Regisil PB; Dentsply).
11. Remove the radiographic guide and the interarch record.
12. Using open tray impression copings (45° UniAbutment Pick-up Ø 4.3 mm), make a verification jig of the implants intraorally with autopolymerizing resin (Pattern Resin LC; GC America) to verify implant position on the working cast (Fig 5).
13. Once implant position in the working cast has been verified with the index, the radiographic guide can be trimmed around the flange to ensure full seating on the cast.

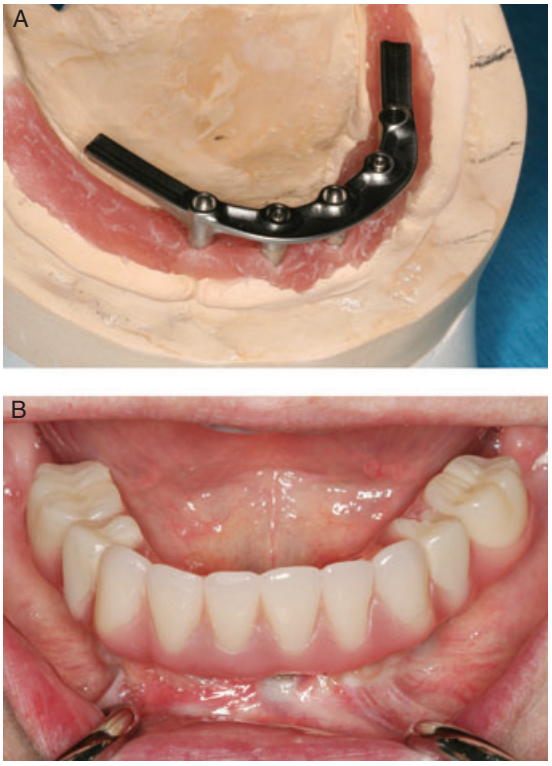

Figure 7 Definitive restoration. (A) Y-Bar milled framework for mandibular fixed complete denture. (B) Definitive fixed complete denture intraorally the day of insertion.

14. The maxillomandibular record can be used to mount the mandibular working cast against the diagnostic cast of the maxillary complete denture (Fig 6).
15. Articulated maxillary and mandibular casts with the radiographic guide can be sent for laboratory milling of the mandibular fixed complete denture framework (Y Bar Framework; Cagenix, Memphis, TN) (Fig 7A).

In this patient scenario, a wraparound fixed complete denture framework was milled, allowing for the denture resin (Lucitone 199; Dentsply) to fully wrap and envelope the underlying framework, ensuring denture resin retention (Fig 7B). The prescribed framework not only allows for good adaptation of the prosthesis to the tissue at the time of insertion but also precludes future repair and re-adaptation. Furthermore, since the fixed complete denture opposes a maxillary complete denture, the risk of fracture of the overlying denture resin and supporting framework is minimal.

Summary

Consistency in prosthesis design existed from initial wax trial insertion, the radiographic guide, and the conversion prosthesis, to the completed definitive prosthesis. The technique of using a duplicate of the newly fabricated complete denture following tooth extraction resulted in a well-designed definitive prosthesis with efficient use of appointment time.

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