

Use of Vacuum-Formed Templates to Guide Tooth Preparation and Insertion of Interim Restorations

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Abstract

Ideal tooth preparation and interim prostheses are critical to a predictable esthetic and functional outcome in the treatment of full-mouth-fixed restorations. During the treatment stages, multiple procedures need to be considered for a successful and predictable outcome. These include the parallel preparation of multiple abutment teeth followed by the relining of the interim prostheses. The purpose of this article is to describe a technique to simplify tooth preparation and facilitate subsequent insertion of a complete-arch-fixed interim prosthesis using vacuum-formed templates.

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The preparation of multiple abutment teeth following the ideal principles of tooth reduction is a complex procedure.¹ The subsequent fabrication of well-fitting, esthetic, and functional interim prostheses is also essential in fixed prosthodontics and crucial for predictable clinical success.¹⁻⁵

In complex prosthodontic treatment, interim prostheses are expected to function for extended periods of time in order to assess alterations in occlusal vertical dimension (OVD), function, esthetics, and speech.⁶⁻⁹ Once idealized, they serve as the esthetic and functional blueprint for the definitive restorations. Heat-processed acrylic resin has traditionally been the material of choice for fabrication of full-arch interim prostheses due to its inherent strength, color stability, resistance to wear, and improved surface texture compared to autopolymerizing resin.^{5,6,10-14}

In cases where the patient presents with long-span partially edentulous spaces, the interim prostheses require cast metal reinforcement. If the tooth preparations on the cast do not accurately relate to the preparations intraorally, it is significantly harder to reline or alter the cast metal reinforcement. The technique presented also offers a solution to this problem.

In the dental literature, various techniques have been described to assess tooth preparations and guide the fabrication of interim restorations.^{1,2,15-18} Commonly used procedures include the use of vacuum-formed shells as indices to assess tooth reduction, followed by impression of tooth preparations and laboratory fabrication of processed interim prostheses. Moskowitz et al¹⁵ described a method to assess tooth preparations in relation to the definitive restorations using irreversible hydrocolloid impression material and vacuum-formed matri-

ces. Limitations include the fact that existing techniques require two clinical appointments, two sets of interim restorations, and additional time and expense.

This article focuses on simplifying the two separate but interrelated procedures of tooth preparation and fabrication of interim prostheses. The use of vacuum-formed templates is presented to simplify the preparation of multiple abutment teeth and the subsequent relining and insertion of a heat-processed interim full-arch-fixed partial denture (FPD) with lingual metal reinforcement in a single visit.

Technique

1. Articulate the diagnostic casts on a semi-adjustable articulator (PCH Articulator, Panadent Corp, Grand Terrace, CA) with facebow transfer and interocclusal centric relation record. Generate diagnostic waxing to full contour and precisely follow the gingival margins.¹⁹ Duplicate with irreversible hydrocolloid and pour the cast in type III dental stone. Cross mount both the diagnostic and duplicate from the wax-up casts on the semi-adjustable articulator.
2. Prepare the abutment teeth of the stone cast by 1 mm, providing appropriate contours. The diagnostic cast preparations should be more conservative than the eventual tooth preparation and should precisely follow the gingival margins, as the teeth are going to be prepared equi-gingivally both on the stone cast and intraorally.¹⁹ Reduce the interproximal areas more than 1 mm to obtain draw. Because they are more convex, these areas generally need more reduction to accommodate proximal physiologic demands.

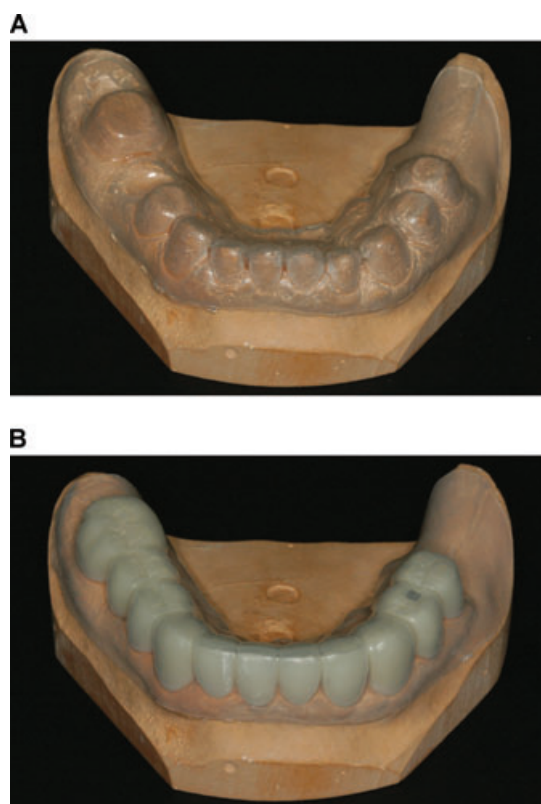


Figure 1 (A) Vacuum-formed template generated on the cast with the lab preparations. (B) Vacuum-formed template generated on the cast with the interim-fixed partial denture (FPD) in place.

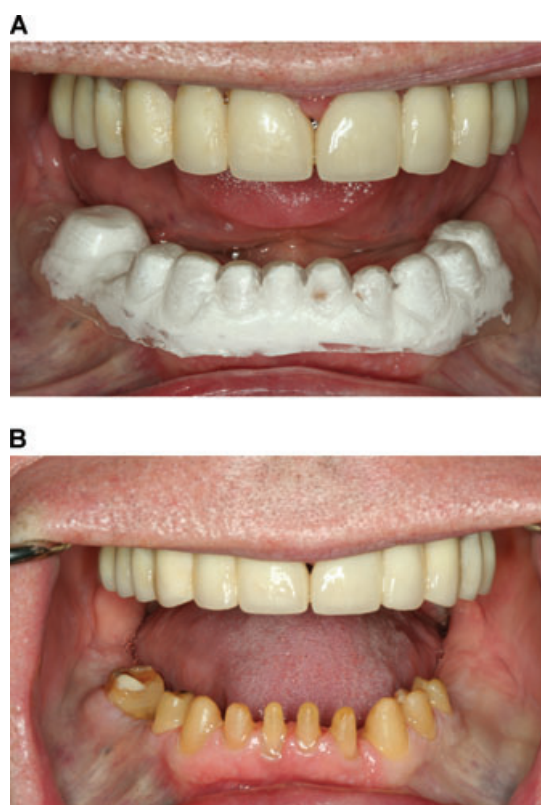


Figure 2 (A) Tooth preparation template intraorally with white disclosing paste to assess adequacy and uniformity of tooth reduction. (B) Intraoral view of tooth preparations.



Figure 3 (A) Insertion template intraorally to position the interim FPD. (B) Intraoral view of cemented interim FPD.

Complete the laboratory work authorizing the dental laboratory technician to fabricate the heat-processed interim FPD with cast metal-reinforcement on the lingual aspect.

3. Use clear 0.02-inch thick thermoforming sheet material (Clear Temporary Splint, Henry Schein Inc, Melville, NY) to generate a vacuum-formed clear matrix over the stone cast with the preparations. This will serve as an intraoral reduction template for the tooth preparation (Fig 1A). Ensure the reduction template is precisely adapted on the gingival margins of the stone cast preparations, while it is thermoformed so as to obtain vertical stops. Secondly, thermoform another clear 0.02-inch thick plastic sheet (Clear Temporary Splint) to make a second vacuum-formed matrix on the same cast with the lab-processed interim FPD in place, to serve as an insertion template (Fig 1B).
4. Extend the matrices 3 to 4 mm apically to the gingival margin of the prepared teeth to ensure adequate stability. Ensure the second vacuum-formed matrix covers the hard palate for maxillary arches or the retromolar pads

and buccal shelves for mandibular arches, respectively. In addition to this, raise the incisal pin 2 mm and inject vinylpolysiloxane (VPS) (Futar D, Kettenbach GmbH & Co KG, Eschenburg, Germany) on the occlusal surface of the second vacuum-formed template positioned on the articulated cast. This will generate an occlusal index that will guide the patient to occlude during the intraoral insertion of this template.

5. Prepare the abutment teeth for the interim FPD, providing appropriate resistance and retention form, according to established guidelines.²⁰ Use depth orientation grooves to aid adequate tooth reduction and place the preparation finish lines at the level of the gingiva.¹⁹ Place the transparent vacuum-formed matrix in the mouth. Assess preparations for adequate reduction visually and by using a white silicone disclosing material (Fit Checker, GC America Inc, Alsip, IL). Eliminate potential interference of the prepared teeth with the preparation matrix (Fig 2A). Relieve the cervical and interproximal areas to ensure that the interim prosthesis has a passive fit on the prepared abutment teeth (Fig 2B).
6. Position the lab-processed interim FPD intraorally with the aid of the second vacuum-formed clear matrix, ensuring the prepared teeth correspond to their respective abutment crowns. Ensure this vacuum-formed insertion template with the interim prosthesis seats passively without any interference (Fig 3A). Provide vent holes on the lingual aspect of the insertion template to allow for excess reline acrylic resin to readily flow, in order to obtain complete seating during the relining procedure.
7. Apply petrolatum on the prepared teeth and wet the intaglio surface of the prosthesis with monomer (Alike, GC America Inc). Mix autopolymerizing acrylic resin (Alike) with flowable consistency, load a plastic disposable syringe (Monoject 412 Syringe, Salvin Dental, Charlotte, NC), and inject onto the intaglio surface of the interim prosthesis in two posterior abutments and one anterior abutment to achieve a tripod effect. Reline the lab-processed interim FPD on the three abutment teeth with the second matrix firmly in place. Support the matrix by instructing the patient to close against opposing dentition with the aid of the previously made occlusal VPS index so as to maintain OVD. Remove the prosthesis after polymerization of the acrylic resin, trim excess, and evaluate tripod, positioning, and maintenance of OVD.
8. Perform final relining procedures for the remaining abutment teeth.²¹ Mark margins with a sharp lead pencil, trim excess, contour inter-proximal areas, and polish the margins of the interim-fixed prosthesis with flour of pumice. Perform minor occlusal adjustment if occlusion is not exact. Cement the interim prosthesis with temporary cement (Tempbond NE; Kerr Manufacturing Co, Romulus, MI) (Fig 3B).

Discussion

Vacuum-formed matrices have been extensively used in fixed prosthodontics, namely for fabrication of chairside interim restorations, dowel-and-core patterns, definitive restorations,

assessment of tooth preparations, and accommodation as spacers for one-step impressions.²²⁻²⁹ This article describes a simplified technique to generate vacuum-formed templates to aid tooth reduction and subsequent insertion of a complete-arch interim-fixed prosthesis. The first template is used to guide and evaluate the tooth preparations, while the second template is used to facilitate the insertion of a full-arch interim-fixed FPD. Advantages of this technique are that it is inexpensive, the reline process is simplified and expedited, and modification of the intaglio surface of the interim restorations is no longer required. In addition to that, the insertion of the second vacuum-formed matrix prevents excess resin from flowing on the polished buccal surfaces of the interim FPD, avoiding esthetic compromise. Finally, parallelism in the preparation of multiple abutment teeth can be carried out efficiently and uniformly.

In the maxillary arch, the hard palate offers adequate stability to the vacuum-formed templates. Limitations of this technique may apply to the mandibular arch since the resiliency of the soft tissue may prevent a stable seating of the template due to absence of rigid landmarks; however, a thick vacuum-formed thermoforming matrix that extends to the retromolar pads and buccal shelves, maximizing soft tissue coverage, provides adequate clinical rigidity and stability. The precise adaptation and lab fabrication of the interim FPD at the gingival margins of the cast, coupled with the tooth preparations also at the gingival margins can provide adequate hard vertical stops to ensure stability.¹⁹ In the clinical scenario where some distal teeth remain intact on the arch, the templates will obtain additional stability by incorporating these teeth. Alternatively, three teeth of the stone cast can be left unprepared with a tripod anterior-posterior spread while thermoforming the reduction template. This will ensure rigid vertical stops necessary for fixed prosthodontic accuracy.

Summary

An inexpensive technique to fabricate a multiple-tooth reduction template following a template for insertion of metal-reinforced interim-fixed prosthesis has been described. This technique simplifies tooth preparation and delivery of lab-processed interim restorations for full-mouth, fixed interim prostheses.

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