

DENTAL TECHNIQUE

In-office fabrication of a definitive cast and duplication of an interim implant-supported fixed acrylic resin complete denture

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Immediate and delayed loading of dental implants with an interim implant-supported fixed acrylic resin complete denture is an established protocol.¹⁻⁶ As osseointegration can be achieved and maintained with the acrylic resin prosthesis, a supporting metal framework is not needed.⁷ Unfortunately, acrylic resin in itself is not sufficiently durable to withstand occlusal forces over an extended time, fracture rates for interim implant-supported fixed acrylic resin complete dentures range between 14% and 88%.⁸⁻¹⁰ As a result, a more durable definitive prosthesis and corresponding prosthetic procedures are needed.

The definitive cast on which the definitive prosthesis is fabricated should be a close duplication of the intraoral situation. Various impression techniques have been developed. Splinted impression copings appear to be the most reliable method of transferring the intraoral implant position.¹¹⁻¹³ The interim implant-supported fixed acrylic resin complete denture can be considered a splinted impression, and the use of this prosthesis to generate the definitive cast has been described previously.¹⁴ The interim implant-supported fixed acrylic resin complete denture has almost all the information needed to produce a definitive prosthesis. The objective is to duplicate this information so that it can be used in the dental laboratory. Although dental stone is most often used to generate casts, it has negative characteristics because of its expansion.¹⁵ Dental stone undergoes delayed

ABSTRACT

The information contained in an interim implant-supported fixed acrylic resin complete denture is a starting point for fabricating the definitive restoration. Duplicating this information in an expedient, precise, and sanitary fashion is desirable so that the interim restoration can be returned to the waiting patient. A technique is described to fabricate an accurate definitive polyvinyl siloxane cast with laboratory analogs bonded to a prepolymerized, dimensionally stable, composite resin base-plate. A screw-retained polyvinyl siloxane duplication of the interim denture is related to this cast. This combination allows for most of the relevant information of the interim denture to be communicated to the dental laboratory. (*J Prosthet Dent* 2017;118:135-139)

expansion up to 96 hours, with 22% to 71% of the expansion occurring after 2 hours.¹⁶⁻¹⁸ Removing the impression from the cast after 96 hours has been suggested to control this delayed expansion.¹⁹

Various techniques have been described to control the expansion of dental stone. Rubber tubes are placed over the implant analogs and the impression is cast. Upon setting and expansion of the stone mass, the tubes are removed, and the small spaces around the analogs are filled with stone.²⁰ Another approach discusses the use of a clear acrylic resin base which is dimensionally stable and reduces the volume of dental stone.^{21,22} The technique described here builds on these 2 concepts. A prepolymerized composite resin base is perforated to allow a small space around the implant analogs; this space is then filled with a small volume of a low-viscosity light-polymerized composite resin. Composite resin does experience volumetric shrinkage (1.54% to 2.11%)²³ upon polymerization. Laboratory composite resin has been reported to have a 1.175% linear polymerization shrinkage. While 80% of the shrinkage occurs in the first 17 minutes,²⁴ dimensional changes have been noted for up to 7 days afterward.²⁵



Figure 1. Immediate loading interim implant-supported fixed acrylic resin complete denture supported by 4 zygomatic implants.

The remainder of the cast is made with a polyvinyl siloxane (PVS) cast material. This cast has the information of the relative implant position and the intaglio of the interim implant-supported fixed acrylic resin complete denture. The same PVS cast material is used to create a duplication of the remainder of the information encoded within the acrylic resin interim prosthesis.

This workflow has been found to be precise, fast, and sanitary. It can be used in the dental office while the patient waits for the return of the interim prosthesis.

TECHNIQUE

1. Place 2 sheets of customized tray light-polymerizing acrylic resin (Triad TruTray; Dentsply Sirona) together. Cut a trapezoid shape of approximately 60×50×40 mm. Polymerize it in a light-polymerizing unit (Triad 2000; Dentsply Sirona). Prepolymerize this baseplate at least 7 days before use.
2. Confirm intraorally that the interim implant-supported fixed acrylic resin complete denture fits accurately. Evaluate the design of the intaglio surface. If modification is necessary, make an impression of the space between the prosthesis intaglio and the edentulous ridge with a polyether material (Impregum Soft; 3M ESPE), because this material will not bond to the cast PVS (Fig. 1).
3. Attach laboratory analogs to the titanium cylinders of the interim implant-supported fixed acrylic resin complete denture.
4. Mark the location of the laboratory analogs on the composite resin baseplate with articulating paper. Then use a rotary instrument to perforate the baseplate to allow passive fitting of the laboratory analogs (Fig. 2).
5. Connect the implant analogs to the composite resin baseplate with a high viscosity composite

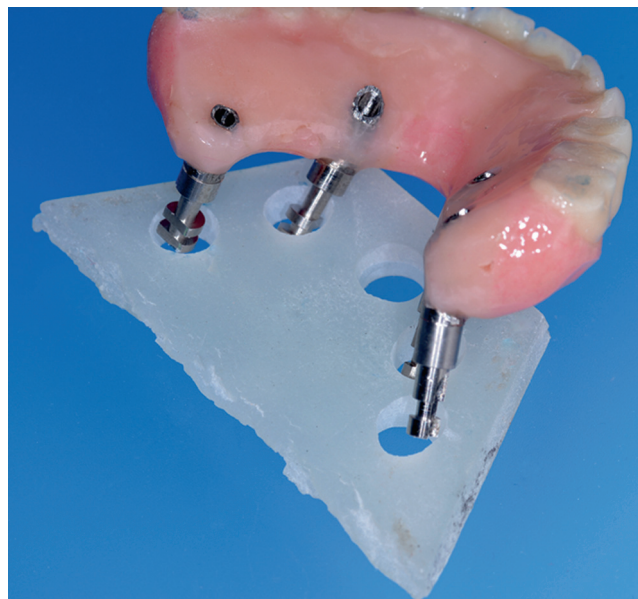


Figure 2. Prepolymerized composite resin baseplate with perforations for laboratory analogs.



Figure 3. Individual analogs bonded with visible light-polymerizing laboratory composite resin to prepolymerized base.

resin material (Primopattern LC Gel; Primotec). Light polymerize (Fig. 3).

6. Mix laboratory PVS (Lab Putty; Coltène) and position the composite resin baseplate with the occlusal surfaces in a horizontal position. Adjust the periphery of the PVS to create a border for boxing wax (Fig. 4).
7. Heat the baseplate wax (Dental Wax Soft; Moyco), cut it in 2 rectangular sections, and box the PVS.
8. Fully cover the interim restoration by injecting cast PVS (Mach-Slo; Parkell) (Figs. 5, 6).
9. After the cast PVS has set, remove the boxing wax, unscrew the interim implant-supported fixed acrylic resin complete denture, and adjust land areas with a scalpel (Bard-Parker 22; Becton-Dickson AcuteCare) (Fig. 7).
10. Reposition the interim implant-supported fixed acrylic resin complete denture. Perforate the lingual land area with a rotary instrument to



Figure 4. Polyvinyl siloxane base made to level occlusal plane and create foundation for boxing wax.



Figure 5. Polyvinyl siloxane cast material injected.



Figure 6. Polyvinyl siloxane cast after removal of boxing wax.



Figure 7. Scalpel used to create smooth and even land area.

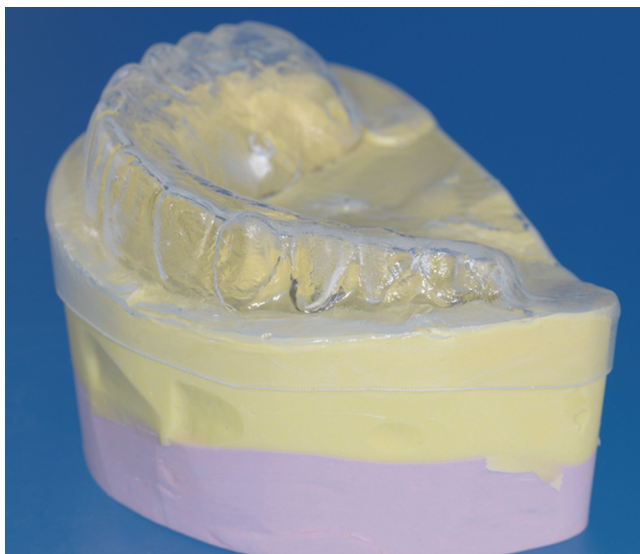


Figure 8. Duplicating vacuum-formed shell captures shape of interim prosthesis and relationship to definitive cast.



Figure 9. Polyvinyl siloxane device supports flexible vacuum-formed shell.

improve vacuum airflow. Use soft duplicating vacuum-forming material (Essix 1-mm Bleach Tray and Model Duplication Material; Dentsply Sirona) to create a duplicate of the interim restoration and land areas of the definitive cast (Fig. 8).

11. Cut the vacuum-formed shell, leaving 10 mm beyond the land areas.

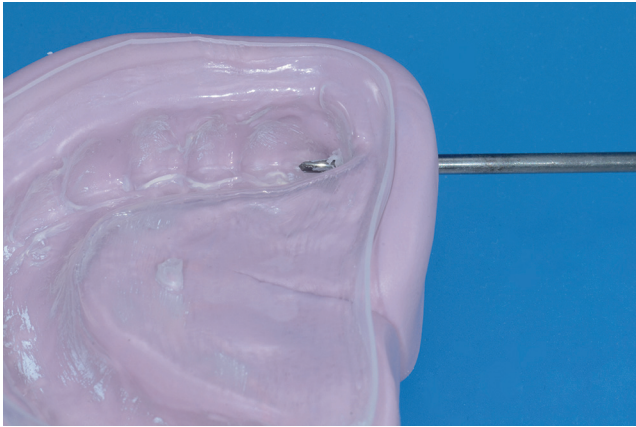


Figure 10. Assemble vacuum-formed shell and polyvinyl siloxane device. Perforate to create access for polyvinyl siloxane syringe.



Figure 11. Inject polyvinyl siloxane cast material.



Figure 12. Screw-retained polyvinyl siloxane duplicate of interim implant-supported fixed acrylic resin complete denture in relation to definitive cast.



Figure 13. Intraoral view of screw-retained polyvinyl siloxane duplicates of interim implant-supported fixed acrylic resin complete dentures.

12. Mix laboratory PVS (Lab Putty; Coltène) and place over the vacuum-formed material (Fig. 9).
13. Remove the PVS device and vacuum-formed shell from the cast upon setting. Assemble and make 2 access holes (Fig. 10).
14. Remove the interim implant-supported fixed acrylic resin complete denture from the cast and lubricate the cast with petroleum jelly (Vaseline; Unilever). Place 2 interim titanium cylinders (Temporary Abutment; Nobel Biocare) and adjust the length to fit within the vacuum-formed shell. Place plastic healing caps (Healing Cap Multi-unit; Nobel Biocare) on the remainder of the implant analogs.
15. Position the assembly of PVS device and vacuum-formed shell on the definitive cast, ensuring proper fit. Inject cast PVS (Mach-Slo; Parkell) into the access hole until the material extrudes from the second access hole (Fig. 11).



Figure 14. New prosthesis based on information contained in polyvinyl siloxane duplicates of provisional implant fixed acrylic complete denture and definitive cast.

16. Remove the device and vacuum-formed shell upon setting of the PVS material. Unscrew the PVS duplicate of the interim implant-supported fixed

acrylic resin complete denture and remove the flask as needed (Fig. 12).

17. Place the PVS duplicate of the interim implant-supported fixed acrylic resin complete denture intraorally and record the occlusal relationship (Fig. 13).
18. Return the interim implant-supported fixed acrylic resin complete denture to the patient.
19. Use the definitive cast, PVS duplicate of the interim implant-supported fixed acrylic resin complete denture, and occlusal registration to fabricate the definitive implant-supported fixed prosthesis (Fig. 14).

DISCUSSION AND SUMMARY

An interim implant-supported fixed acrylic resin complete denture contains most of the information needed to initiate the production of the definitive prosthesis. The technique presented here allows for expedient in-office fabrication of a PVS definitive cast with a prepolymerized, dimensionally stable, composite resin baseplate and bonded analogs. A PVS duplicate of the interim prosthesis is related to this definitive cast, allowing transfer to the dental laboratory of most of the pertinent information needed to fabricate a definitive restoration. This workflow allows for the rapid return of the interim implant-supported fixed acrylic resin complete denture to the patient while obtaining accurate information in a clinical setting.

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