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DENTAL TECHNIQUE

A device to improve fabrication of a conversion prosthesis for immediate loading of dental implants

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ABSTRACT

A common challenge of fabricating a conversion prosthesis for immediate loading of dental implants is preventing the acrylic resin from flowing over the polished metal cuff of the titanium cylinders. Excess acrylic resin that accidentally flows over the polished metal cuff and adheres to it can impede insertion and the proper fit of the conversion prosthesis after surgery. Subsequent removal of the excess acrylic resin using rotary or hand instruments can scratch and damage the polished metal cuff, resulting in increased plaque accumulation and subsequent inflammation and the potential for hard and soft tissue loss during the early stages of healing. This article describes a novel device, a conversion cap, that can be screwed into the titanium cylinders to prevent any acrylic resin from flowing over the polished metal cuff. In addition, it can be attached during finishing and polishing the conversion prosthesis or definitive prosthesis to eliminate any risk of scratches over the metal cuff and allow dental laboratory technicians and clinicians to improve the quality of the prostheses. (J Prosthet Dent 2018;■:■-■)

During the past 10 years, immediately loaded complete-arch fixed implant-supported prostheses have become a popular approach to the treatment of patients with edentulism. Popular treatment concepts such as All-on-4 have streamlined the rehabilitation of the edentulous maxilla and mandible, with high implant and prosthetic survival rates.[1,2] Immediate loading of dental implants in an edentulous jaw involves either the chairside conversion or dental laboratory–assisted conversion of an existing complete denture to an interim complete-arch fixed implant-supported prosthesis (called a conversion prosthesis).[3,4] Another emerging option for immediate loading is the insertion of a prefabricated prosthesis using computer-aided engineering and cone beam computed tomography.[5]

The technique of chairside conversion of an immediate or conventional denture to a complete-arch, fixed implant-supported prosthesis was first described by Balshi in 1985.[3] This technique is still popular because of its simplicity, adaptability to changes in planned implant positions, and reduced treatment cost. Nevertheless, this is a multistep, technique-sensitive process.[3,4] One of the key steps in the conversion process requires the clinician or dental laboratory technician to backfill the denture with autopolymerizing acrylic resin after the titanium cylinders are attached.[3] This is performed to develop a flat or convex contour for a hygienic and esthetic emergence profile for the conversion prosthesis.[6] The backfill procedure is typically accomplished extraorally by connecting an abutment analog to the titanium cylinder and then injecting acrylic resin from a disposable syringe or manually introducing the acrylic resin using a spatula and additional instruments.[6] The unsolved challenge during the backfill procedure is the lack of predictably to preventing acrylic resin from flowing over the cuff of the titanium cylinders. This is because the connection of the titanium cylinder to the abutment analog is currently designed by all implant manufacturers as a butt joint, which only protects the inside of the titanium cylinders (Fig. 1).

The titanium cylinders for most implant manufacturers also have a 1-mm polished metal cuff at the base, where the cylinders fit over the abutments. The purpose of this cuff is to allow for a smooth machined interface of a standard diameter that is free of any acrylic resin, which can easily pass through the soft tissues and enable proper seating of the prosthesis to the abutments. Another

The author owns a United States Provisional Patent on the novel device described in the manuscript, and the technology is currently licensed to Preat Corporation, USA.

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Figure 1. Common design for connection of titanium cylinder to abutment analog as butt joint, which only protects inside of titanium cylinders. Note that polished metal cuff not protected by abutment analog.

Figure 2. Conversion prosthesis where polished metal cuff has severe scratches from rotary instrument during removal of excess acrylic resin as part of trimming and polishing procedures. This patient presented with significant soft tissue inflammation around implants.

Figure 3. Conversion cap connected to titanium cylinder using prosthetic screw. Conversion cap has dimensions that accurately match with external dimensions of polished metal cuff for shielding against acrylic resin and rotary trimming and polishing instruments.

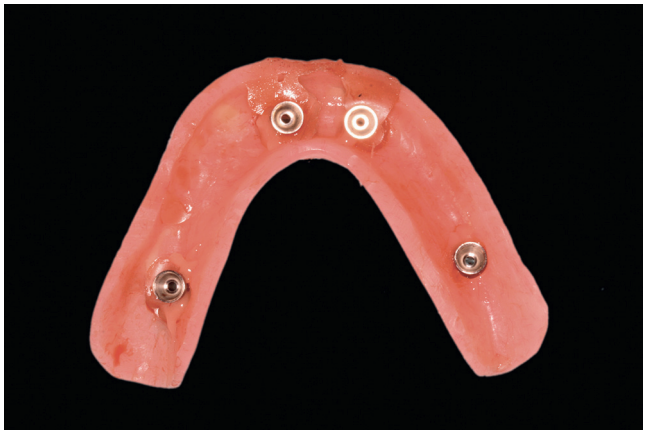

Figure 4. Mandibular immediate denture connected to 4 titanium cylinders using autopolymerizing resin before conversion process.

purpose of the polished metal cuff is to allow the clinician to visually assess the accurate seating of the prosthesis and facilitate proper oral hygiene procedures by the patient.

Undetected excess acrylic resin that accidentally flows over the polished metal cuff of the titanium cylinders and adheres to it can impede insertion and proper fit of the conversion prosthesis after surgery, leading to misfit and its subsequent complications. The removal of any excess acrylic resin that has polymerized over the cuff using rotary or hand instruments can result in scratches in the polished metal cuff (Fig. 2). This rough surface can result in increased plaque accumulation and subsequent inflammation and has the potential for hard and soft tissue loss during early stages of healing.[7-9] Presently, the method for preventing acrylic resin from flowing over the polished metal cuff is to lubricate the polished metal cuff with petrolatum and then remove any excess acrylic resin. However, this method is inadequate and can lead to unfavorable outcomes.

The purpose of this article was to describe a novel device called a conversion cap that can be screwed into the titanium cylinders using guide pins or abutment screws to prevent any acrylic resin from flowing over the polished metal cuff. The conversion cap has a dimension that accurately matches the external dimension of the polished metal cuff and, therefore, shields it completely and eliminates the possibility of any acrylic resin from flowing over the cuff (Fig. 3). In addition, the conversion cap can aid during rotary finishing and polishing the conversion prosthesis or subsequent definitive prosthesis to eliminate any risk for scratches on the polished metal cuff of the titanium cylinders, thereby allowing dental laboratory technicians and clinicians to

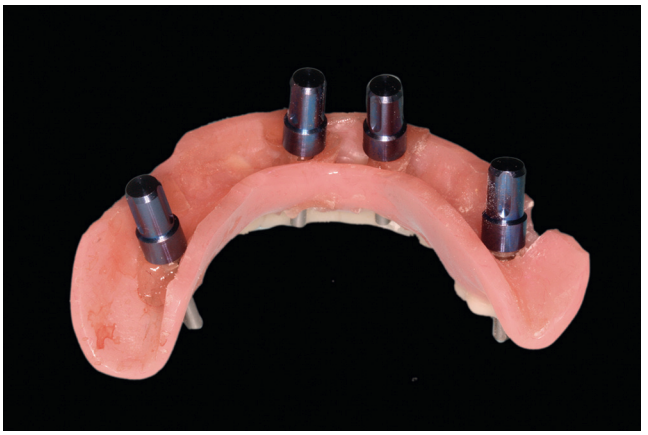

Figure 5. Conversion cap connected to titanium cylinders using guide pins. It is necessary to ensure that conversion cap completely seated and that entire polished metal cuff of each titanium cylinder completely covered.

Figure 6. Conversion of immediate denture to implant-supported fixed prosthesis accomplished by backfill of denture by injecting acrylic resin from disposable plastic syringe.

Figure 7. Conversion prosthesis trimmed and polished with rotary instruments.

Figure 8. Low-profile conversion cap used during polishing with pumice and rag wheel. This eliminates possibility of conversion prosthesis becoming snagged in rag wheel with risk of damage to prosthesis.

improve the quality of the prostheses. Its advantages include its affordability and the opportunity for reuse. The disadvantage of the conversion cap is that it cannot be used when the prosthesis is fabricated at an implant level because the titanium cylinders in such situations are designed to engage the internal aspect of the implant and lack a polished metal cuff. They are presently manufactured for major implant systems and can be easily manufactured for any implant system.

TECHNIQUE

1. After implant and abutment placement is completed, connect the titanium cylinders to the abutments and then lute the immediate denture to the titanium cylinders using autopolymerizing resin (Quick Up; Voco) (Fig. 4).
2. Connect the conversion cap (Conversion Smart Polishing Cap; Preat Corp) to each of the titanium cylinders using either guide pins or prosthetic screws. Ensure that the conversion cap is completely seated and the polished metal cuff around each titanium cylinder is completely covered (Fig. 5). If the intaglio surface of the immediate denture impedes seating of the conversion cap in any direction, relieve the intaglio surface as needed.
3. Perform the backfill procedure by injecting autopolymerizing resin (Bosworth Original Truliner; Keystone Industries) into the immediate denture using a disposable plastic syringe (Patterson Dental) and fill in all the spaces between the titanium cylinders (Fig. 6).
4. After the acrylic resin has polymerized, section, trim, and polish the conversion prosthesis using standard rotary denture adjustment and polishing tools to obtain a convex and smooth surface (Fig. 7). To polish using the rag wheel and pumice on a lathe, use the low-profile design of the conversion cap

Figure 9. Finished conversion prosthesis after removal of conversion caps shows absence of acrylic resin over polished metal cuff and free of any scratches from trimming and polishing procedures.

(Low Profile Conversion Smart Polishing Cap; Preat Corp) to avoid the possibility of the prosthesis becoming snagged by the rag wheel and risk of damage to the conversion prosthesis (Fig. 8).

5. Remove the conversion caps by unscrewing the prosthetic screws, confirm the absence of any acrylic resin over the polished metal cuff of the titanium cylinders (Fig. 9), and then proceed with insertion in the mouth.

SUMMARY

This article described a novel device to improve the conversion process during fabricating a complete-arch conversion prosthesis for immediate and delayed loading of dental implants. The conversion cap is intended to protect the marginal and external aspects of the titanium cylinder during the conversion process. Protecting the polished metal cuff of the titanium cylinders allows proper fit of the conversion prosthesis and eliminates the risk of scratches over the polished metal cuff of the titanium cylinders during finishing and polishing, thereby allowing dental laboratory technicians and clinicians to significantly improve the quality of the conversion prostheses.

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