A technique for retrieval of cement-retained implant-supported prostheses

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Predictable retrievability of cement-retained prostheses has been a clinical concern. This article presents a technique that describes an implant restoration design which will allow predictable removal of cement-retained implant-supported prostheses. (J Prosthet Dent 2011;106:131-135)

Retrievability of implant-supported dental prostheses is an important aspect of patient care due to potentially unpredictable biological and/or mechanical complications that may occur.[1] It has been reported that one disadvantage of cement-retained implant-supported prostheses is the lack of predictable retrievability compared to screw-retained implant-supported prostheses.[2-5] However, cement-retained prostheses may offer other clinical advantages compared to screw-retained prostheses, such as greater passivity of fit, less incidence of ceramic veneer fracture, improved esthetics, reduced cost and complexity of laboratory procedures, and the ability to create a more precise occlusion and compensate for mal positioned implants.[2-7] Predictable retrievable cement-retained implant-supported prostheses would also enhance the clinician's ability to facilitate maintenance, repair, and replacement of these prostheses when necessary.

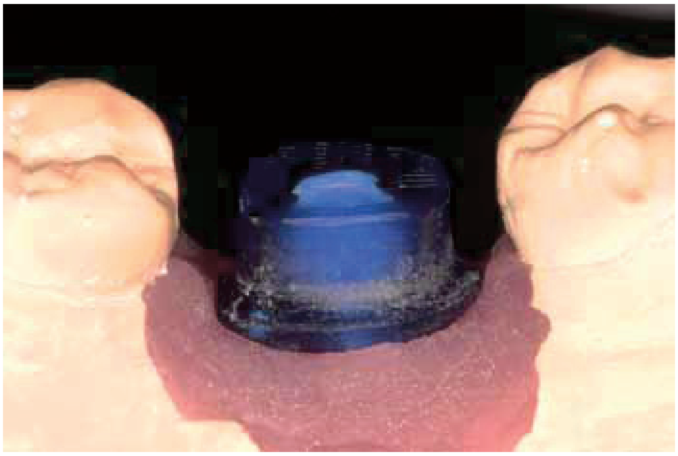
The proposed technique involving a lingual retrieval slot mechanism was originally described by Prestipino et al.[5] This article describes a similar design but with modifications and a detailed description of the laboratory fabrication. The procedure can be performed with either customized implant abutments or prefabricated, machined implant abutments for single or multiple-unit fixed prostheses. The procedure requires a metal alloy abutment-to-prosthesis interface and uses a slot driver to facilitate retrieval of the prosthesis. The proposed technique is used to fabricate customized implant abutments with a lingual retrieval slot at the abutment/prosthesis interface.

TECHNIQUE

1. Fabricate an acrylic resin pattern for a castable, screw-retained abutment (GoldAdapt 29014; Nobel Biocare Management AG, Zürich-Flughafen, Switzerland) to ideal tooth preparation dimensions with autopolymerizing acrylic resin (Pi-Ku-Plast HP36; bredent GmbH & Co KG, Senden, Germany), (Fig. 1). Make the lingual/palatal shoulder approximately 1 mm coronal to and follow the contours of the free gingival margin (Fig. 2).

2. Mill a lingual/palatal slot into the abutment mounted on a milling cast model using a milling bur (H364E; Brasseler USA, Savannah, Ga), (Fig. 3). Prepare the slot a minimum of 1 mm in axial depth and 3 mm in mesiodistal width, creating enough volume to incorporate the functional end of the implant slot driver (RASD6; Biomet 3i Corp, Warsaw, Ind) that will be used for retrieval (Fig. 4).

3. Invest and cast the custom abutment in Type IV high noble alloy metal (JIV; Jensen Dental, North



1 Customized screw-retained abutment incorporated in autopolymerizing acrylic resin pattern to ideal proportions.

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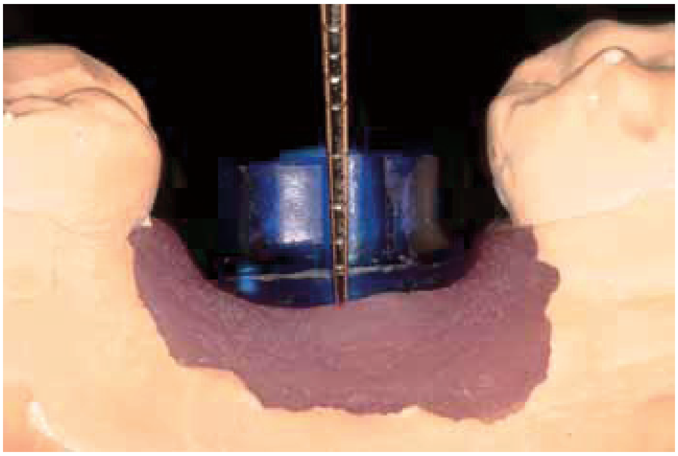
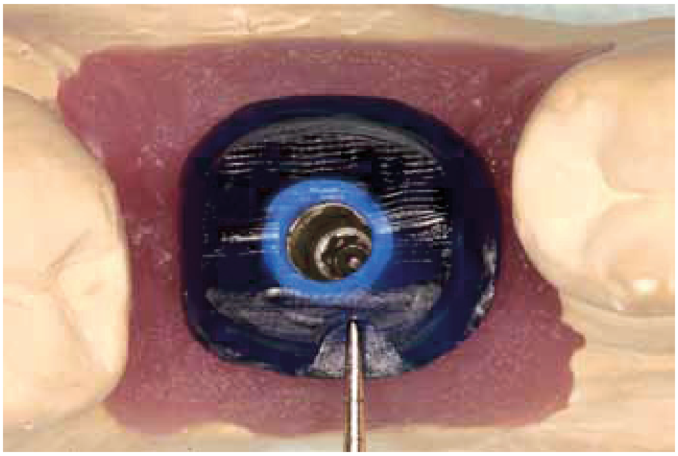
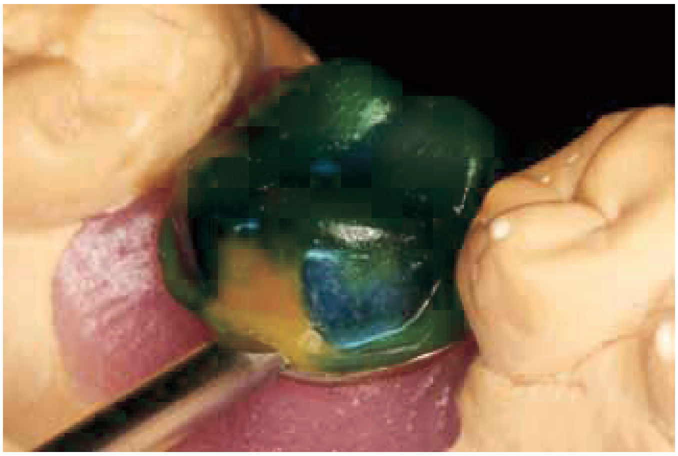


2 Lingual/palatal shoulder of abutment developed approximately 1 mm coronal to free gingival margin.

3 Lingual/palatal slot milled into abutment using milling bur.



4 Milled slot should be minimum 1 mm in axial depth and wider in mesial-distal width than functional end of implant slot driver.



5 Functional end of slot driver placed within confines of lighter color wax along abutment shoulder and pressed until it contacts axial wall of milled customized abutment.

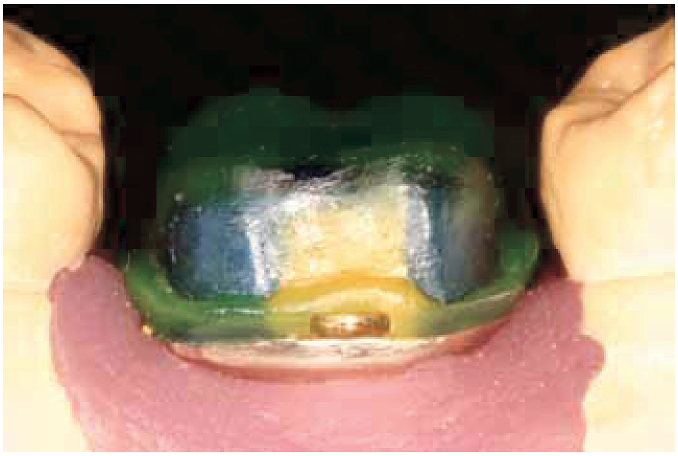
Haven, Conn). Once divested and cleaned, mill the custom abutment on a milling cast to ideal dimensions and form. Then finish and polish the customized abutment.

4. Fabricate an autopolymerizing acrylic resin substructure (Pi-Ku-Plast HP36; bredent GmbH & Co KG) over the cast customized abutment with a minimum thickness of 0.5 mm. Ensure that the substructure does not cover the area of the milled slot. Develop an anatomic contour waxing on the substructure and then cut it back to the dimensions needed for porcelain application; apply milling wax (Biotec Modelling Wax, #510 006 11, XP-dent, Miami, Fla) to the acrylic resin substructure; apply dipping wax (Duo Dip; YETI Dentalprodukte GmbH, Engen, Germany) of a lighter color to the area of the slot to help with subsequent identification of its location.

5. Heat the functional end of a slot driver (RASD6; Biomet 3i Corp) in a flame and place it within the confines of the lighter colored wax along the abutment shoulder. Press until it contacts the axial wall of the milled customized abutment (Fig. 5), creating an opening (the retrieval slot) at the margin of the crown, that is approximate dimensions of the slot driver (Fig. 6). Debride, invest, and cast the wax pattern with a high noble metal porcelain alloy (JP-1; Jensen Dental). Once cast, divest and finish the metal casting. Apply porcelain conventionally.[8]

6. After fitting, adjusting, and finishing, lute the prosthesis intraorally with a luting agent (TempBond NE; Kerr Corp, Orange, Calif). Remove the excess cement, including any within the retrieval slot. Fill the retrieval slot with a resilient composite resin material (Fermit N; Ivoclar Vivadent, Schaan, Liechtenstein), (Fig. 7).

7. Dislodge and retrieve the prosthesis (if necessary) by removing the resilient composite resin material within the retrieval slot with a hand instrument, such as a scaler or an explorer. Then insert the slot driver within a torque driver (CATDB; Biomet 3i Corp) into the retrieval slot, brace with finger pressure, and apply 32 Ncm of torque with a torque controller (CATC3; Biomet 3i Corp). Break the cement seal and dislodge the prosthesis (Figs. 8, 9).



6 Slot created in waxing.

7 Retrieval slot of definitive crown.

8 Slot driver within torque driver inserted into retrieval slot.

9 Torque applied with torque controller breaking cement seal and dislodging prosthesis.

DISCUSSION

The presented technique describes the fabrication of a predictably retrievable cement-retained implant-supported prosthesis. Similar to the technique proposed by Prestipino et al,[5] the proposed retrieval slot mechanism allows a slot driver, upon rotation within the retrieval slot, to simultaneously apply a coronal force to the prosthesis superstructure and an apical force to the supporting abutment sufficient to break the cement seal and separate the 2 components. This design creates a lock and key fit between the slot driver and the retrieval slot within the abutment/prosthesis interface, decreasing the possibility of the slot driver dislodging during rotation when torque is applied, which can potentially damage the slot and render it less effective. Additionally, the slot can also be positioned towards the mesiolingual line angle of posterior restorations to allow for improved clinical access. When fabricating multiunit fixed prostheses, this type of retrieval mechanism can be incorporated into multiple parallel-milled abutments with 4 to 6 degrees convergence each to successfully retrieve the prosthesis when necessary (Fig. 10). To dislodge a multi-unit fixed prosthesis, the retrieval slots can be used individually to eventually break the entire cement seal (Figs. 11, 12).

Placement of the lingual/palatal shoulder approximately 1 mm coronal to contours of the free gingival margin aids in optimizing the health of the supporting tissues, enhances the patient's ability to perform adequate oral hygiene, facilitates luting agent removal, and helps with visual verification of complete seating of the prosthesis.[9-12] Prefabricated abutments, although less costly than custom milled abutments, often do not have ideal margin positioning relative to the free gingival margin, creating a potential compromise relative to these aspects of treatment. With regard to proper oral hygiene, sealing the retrieval slot with resilient composite resin closes what is essentially an open margin. Use of a resilient composite resin, as opposed to a composite resin, allows for the removal of the material with hand instrumentation, such as a periodontal scaler instead of a rotary instrument. This minimizes the amount of potential damage to the retrieval slot when removing the filling material. Furthermore, the use of high noble alloys of greater hardness for both the customized milled abutment and the prosthesis casting aids in preventing significant distor-

10 Multi-unit fixed prosthesis with 3 retrieval slots.

11 Multi-unit fixed prosthesis being partially dislodged by engagement of first premolar abutment.

12 Full dislodgment of the multiunit fixed prosthesis by subsequent engagement of first molar abutment.

tion of the retrieval slot. These alloys are also more corrosion resistant and may have less potential for local toxicity affecting the periimplant tissues.[13]

The advantages of retrievable implant-supported prostheses are widely accepted. Screw retention allows the clinician to remove the prostheses predictably. Although this usually occurs at the expense of, most notably, an intact occlusal table and passivity of prosthesis fit, potentially leading to related complications. The design feature presented allows the clinician to use the previously described advantages of cement-retained implant-supported prostheses with the predictable retrieval ability formerly afforded only by screw-retained implant-supported prostheses.

SUMMARY

Predictable retrievability of cement-retained implant-supported prostheses is a clinical concern. The technique presented incorporates a design feature that allows for easy and predictable retrieval of cement-retained implant-supported prostheses to facilitate required maintenance and repair or replacement of the prosthesis by the clinician.

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NOTEWORTHY ABSTRACTS OF THE CURRENT LITERATURE

Bone mineral apposition rates at early implantation times around differently prepared titanium surfaces: a study in beagle dogs

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Purpose. This study evaluated the bone mineral apposition rate (MAR) at the bone-implant interface region of alumina-blasted/acid-etched (AB/AE), plasma-sprayed hydroxyapatite (PSHA), and nanometric-scale bioceramic-coated surfaces at early implantation times in a dog tibia model.

Materials and methods. Implants (n = 12 per group) with three different surfaces-AB/AE, PSHA, and a bioceramic coating in the 300- to 500-nm thickness range-were placed bilaterally along the proximal tibiae of six male beagles. Implants remained for 3 and 5 weeks in vivo. Ten and 2 days prior to euthanization, calcein green and oxytetracycline were administered for bone labeling. Following euthanization, the limbs were retrieved by sharp dissection and the implants and bone were processed nondecalcified into ~30-Mm-thick sections along the implant long axis. MAR was measured by the distance between bone labels over time at the interface region (to 0.5 mm from the implant surface) and at regions > 3 mm from the implant surface (remote site). A generalized linear mixed-effects analysis of variance model was conducted with significance levels set at .05.

Results. Irrespective of implant surface, the MAR at the interface region was significantly higher than the MAR at the remote site. Significant MAR differences in the interface region were observed between the different surfaces (PSHA > AB/AE > nano).

Conclusions. Bone kinetics during early healing stages were influenced by implant surface modifications.