An alternative direct technique for the fabrication of an implant-supported, screw-retained fixed interim restoration

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The interim implant restoration is an essential part of implant treatment, particularly in the anterior region. Various types of interim restorations have been described, such as soft tissue and/or tooth-supported removable prostheses, tooth-supported fixed prostheses, and implant-supported fixed restorations.[1,2] The purpose of fabricating an interim restoration involves the esthetic and functional replacement of the missing dentition until a definitive prosthesis is fabricated and placed.[1] Interim restorations can also be used for shaping and preserving the subgingival emergence profile of the periimplant soft tissue.[1-3]

Single fixed implant-supported interim restorations are commonly used in the anterior region and are essential to optimal long-term esthetic outcomes.[1,2,4] Implant-supported fixed interim restorations can be fabricated with different methods.[5-8] Extended chair or laboratory time and additional laboratory fees are disadvantages of some of the previously described techniques. Those techniques primarily require preoperative preparations, such as diagnostic waxing to form the interim restorations. Moreover, the temporary abutments add some cost to those lengthy laboratory and chairside procedures. The technique uses a kit (UTA; Universal Transitional Abutment, Vandalia, Ohio) available for 6 different, commonly used implant systems (Astra Tech; Molndal, Sweden; Biohorizons; Birmingham, Ala; Certain; Biomet 3i, Palm Beach Gardens, Fla; Active and Select; Nobel Biocare, Goteborg, Sweden; Institut Straumann AG, Basel, Switzerland; Zimmer Dental, Carlsbad, Calif). The kit includes machined acrylic resin tooth laminates available in 4 different colors (B0, A1, A2 and A3.5) with corresponding interim cylinders (abutments) available in different diameters for each implant system. The product allows for customization of the components (interim cylinders and screws) for clinicians. Interim cylinders, screws, and acrylic resin laminate teeth can be combined from different systems in 1 box. The palatal aspect of an acrylic resin laminate tooth is prepared so that it can adapt to the corresponding cylinder, which is milled according to the lingual surface of the laminate veneer. The advantage of this technique is that clinicians can fabricate interim restorations for multiple implant types intraorally with commonly available products. Using the UTA and machined acrylic resin tooth allows the creation of an esthetic interim restoration, including shaping the subgingival emergence profile in a more time-efficient manner than with conventional methods. The UTA system has been developed to avoid the need for several interim abutments from several different systems in inventory. The UTA system is designed to be universal in nature so that a single interim inventory with the associated milled denture tooth can serve several different implants systems. The UTA system can be used in single and multi-unit situations. This technique can be used for immediate applications as well as with a delayed protocol, and no impression is required. An advantage of this abutment is that the radiopaque abutment material enables the clinician to detect any potential unseating of the abutment on the implant.

The system does not have an antirotational feature, which allows it to be universal. This may be perceived as a disadvantage by some; however, this has not been noted as a problem in routine clinical use. The abutments (interim cylinders) are available for only 1 length, which may be a limitation in some patients where the implant has been placed apically in the bone and where the soft tissue between the implant platform and the free gingival margin is thick. In such patients, the length of the abutment may not be sufficient to retain the crown and establish a pleasing view of the provisional crown. Fabrication of abutments in varying heights could

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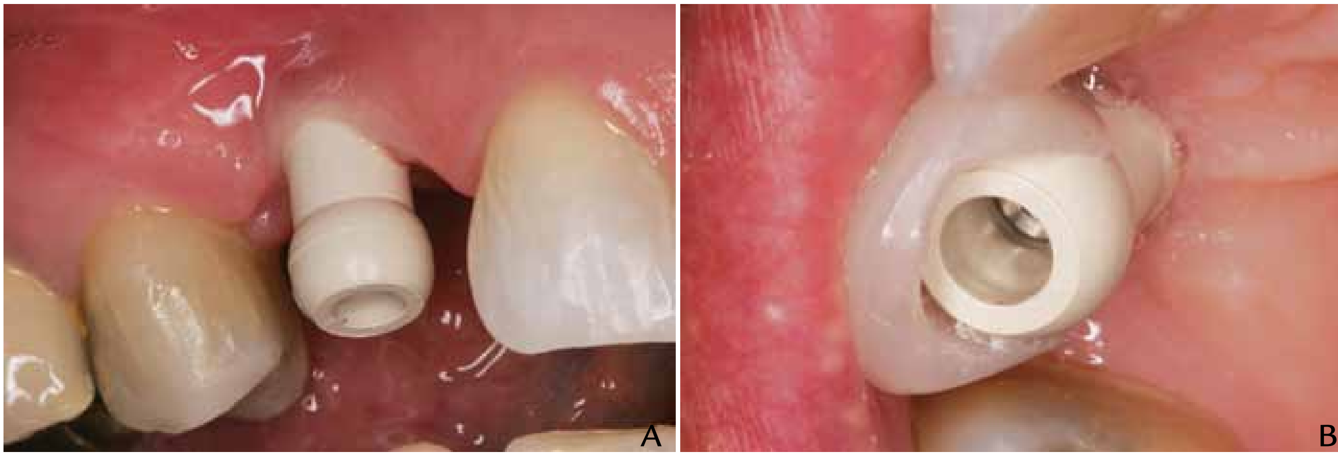
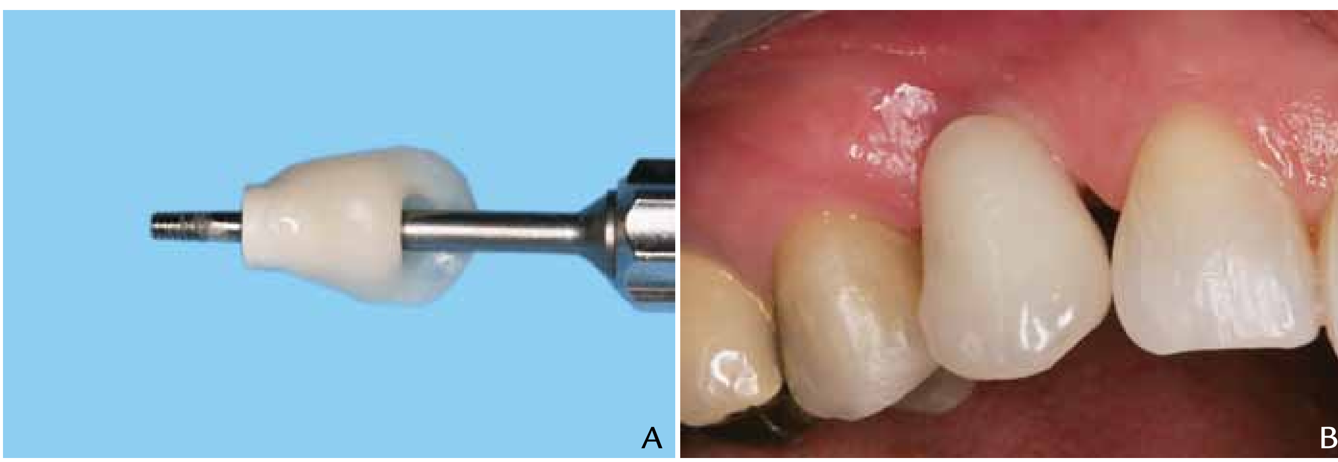


1 A, Cylinder screwed on implant. B, Laminate veneer-temporary cylinder foundation.



2 A, Acrylic resin applied laminate veneer-temporary cylinder foundation after polishing. B, Intraoral view of directly fabricated interim restoration.

be helpful for apically positioned implants and areas of increased soft tissue thickness. This technical report describes the fabrication of an interim restoration using a universal provisional abutment kit.

PROCEDURE

1. Choose the appropriate shade and size of the acrylic resin laminate tooth and prefabricated interim cylinder (UTA; Universal Transitional Abutment) diameter for the implant to be restored.

2. Connect the prefabricated abutment cylinder (UTA; Universal Transitional Abutment) onto the implant intraorally and hand torque the corresponding screw by using finger pressure (Fig. 1A). Make a periapical radiograph to verify the proper seating of the cylinder on the implant.

3. Evaluate the interocclusal space and make adjustments as needed since the polyethylene ethylene ketone (PEEK) material allows intraoral interocclusal preparation with a diamond rotary cutting instrument.

4. Once the appropriate interocclusal clearance has been achieved, snap the acrylic resin laminate tooth onto the cylinder, feeling the friction connection between the cylinder and the laminate (Fig. 1B).

5. Apply petroleum jelly to the soft tissue profile and bond the cylinder to the acrylic resin laminate tooth, applying an interim bisacryl resin material (Protemp Plus; 3M ESPE Dental Products, St Paul, Minn.) on the palatal side of the laminate. Ensure that the acrylic resin covers the incisal and soft tissue profile of the cylinder. Before application of the acrylic resin, place a small piece of cotton into the screw hole to prevent the flow of acrylic resin into this area.

6. Allow the acrylic resin to polymerize intraorally, unscrew the foundation once the acrylic resin is polymerized, and remove the cylinder-acrylic resin laminate tooth foundation from the mouth.

7. Carefully inspect the foundation and add acrylic resin to the voids as needed to achieve a properly sealed margin and place the foundation onto the implant for the additional acrylic resin to polymerize properly.

8. After unscrewing and removing the foundation from the mouth, smooth and polish the applied resin with disks (Sof-Lex; 3M ESPE Dental Products) to establish an optimal emergence profile for the definitive restoration (Fig. 2A).

9. Place the interim restoration onto the implant, evaluate the occlusion and interproximal contacts, and make adjustments as needed.

10. Once the adjustments are fin-

ished, torque the screw of the interim restoration to 20 Ncm into the implant, place a piece of cotton on top of the screw head, and seal the access hole with a temporary restorative material (Fermit; Ivoclar Vivadent, Schaan, Liechtenstein) (Fig. 2B). Fabricate the definitive restoration once the healing is completed.

REFERENCES

1. Priest G. Esthetic potential of single implant provisional restorations: selection criteria of available alternatives. J Esthet Restor Dent 2006;18:326-38.
2. Sadan A, Blatz MB, Salinas TJ, Block MS. Single-implant restorations: a contemporary approach for achieving a predictable outcome. J Oral Maxillofac Surg 2004;62:73-81.
3. Phillips K, Kois J. Aesthetic peri-implant site development. The restorative connection. Dent Clin North Am1998;42:57-70.
4. Lindeboom JA, Frenken JW, Dubois L, Frank M, Abbink I, Kroon FH. Immediate loading versus immediate provisionalization of maxillary single tooth replacements: a prospective randomized study with BioComp implants. J Oral Maxillofac Surg 2006;64:93642.
5. Lin WS, Ercoli C. A technique for indirect fabrication of an implant-supported, screw-retained, fixed provisional restoration in the esthetic zone. J Prosthet Dent. 2009;102:393-6.
6. Spyropoulou PE, Razzoog M, Sierraalta M. A technique for indirect fabrication of a complete-arch, implant-supported, fixed provisional restoration from a radiographic template. J Prosthet Dent. 2010;104:199-203.
7. Ganddini MR, Tallents RH, Ercoli C, Ganddini R. Technique for fabricating a cement-retained single-unit implant supported provisional restoration in the esthetic zone. J Prosthet Dent 2005;94:296-8.
8. Tselios N, Parel SM, Jones JD. Immediate placement and immediate provisional abutment modeling in anterior single tooth implant restorations using a CAD/CAM application: a clinical report. J Prosthet Dent 2006;95:181-5.

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Noteworthy Abstracts of the Current Literature

Slow crack growth and reliability of dental ceramics

Gonzaga CC, Cesar PF, Miranda WG Jr, Yoshimura HN.
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Objective. To determine the slow crack growth (SCG) and Weibull parameters of five dental ceramics: a vitreous porcelain (V), a leucite-based porcelain (D), a leucite-based glass-ceramic (E1), a lithium disilicate glass-ceramic (E2) and a glass-infiltrated alumina composite (IC).

Methods. Eighty disks (Ø 12 mm × 1.1mm thick) of each material were constructed according to manufacturers' recommendations and polished. The stress corrosion susceptibility coefficient (n) was obtained by dynamic fatigue test, and specimens were tested in biaxial flexure at five stress rates immersed in artificial saliva at 37 °C. Weibull parameters were calculated for the 30 specimens tested at 1 MPa/s in artificial saliva at 37 °C. The 80 specimens were distributed as follows: 10 for each stress rate (10(-2), 10(-1), 10(1), 10(2)MPa/s), 10 for inert strength (10(2)MPa/s, silicon oil) and 30 for 10(0)MPa/s. Fractographic analysis was also performed to investigate the fracture origin.

Results. E2 showed the lowest slow crack growth susceptibility coefficient (17.2), followed by D (20.4) and V (26.3). E1 and IC presented the highest n values (30.1 and 31.1, respectively). Porcelain V presented the lowest Weibull modulus (5.2). All other materials showed similar Weibull modulus values, ranging from 9.4 to 11.7. Fractographic analysis indicated that for porcelain D, glass-ceramics E1 and E2, and composite IC crack deflection was the main toughening mechanism.

Conclusions. This study provides a detailed microstructural and slow crack growth characterization of widely used dental ceramics. This is important from a clinical standpoint to assist the clinician in choosing the best ceramic material for each situation as well as predicting its clinical longevity. It also can be helpful in developing new materials for dental prostheses.

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