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DENTAL TECHNIQUE

An auxiliary device for screw-retained fixed implant restorations which prevents extrusion of cement into screw-access openings

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ABSTRACT

For screw-retained fixed implant prostheses, the cement that extrudes onto the margin can be easily removed, but the cement that may intrude into the screw-access opening (SAO) during the extraoral bonding process is difficult to eliminate. This article presents a manufactured auxiliary device that is applied to the extraoral bonding process of screw-retained fixed implant prostheses. This device will prevent excess cement from being left in the SAO. (J Prosthet Dent 2021;126:178-80)

Fixed implant restorations can be either screw- or cement-retained.[1] Compared with cement-retained implant restorations, screw-retained implant restorations eliminate the possibility of the adverse biologic consequences associated with residual cement.[2,3]

Titanium abutments have high survival rates because of their excellent physical properties,[4] but they may cause grayish discoloration of surrounding soft tissues when used in highly visible anterior regions.[5,6] Zirconia abutments with titanium inserts have been widely used as alternatives in anterior areas.[7,8] For screw-retained fixed restorations, the titanium insert, zirconia abutment, and the definitive restoration should be bonded together extraorally and then fixed intraorally by screw retention. During the extraoral bonding process, the amount of cement applied may not be well controlled. Excess cement may extrude outside the margin of the restoration and may also intrude into the SAO. In clinical practice, excess cement is easily removed from around the margin but difficult to remove from the SAO. If the cement remains on the intaglio wall of the screw hole, it will interfere with the insertion of the retention screw. Moreover, residual cement will affect the seat of the screw in the abutment, which may lead to later screw loosening.

To solve this problem, an auxiliary device for assisting in the extraoral bonding process of screw-retained fixed implant prostheses was developed. Its purpose was to prevent excess cement from overflowing into the SAO and to ensure that the retention screw can be fully seated.

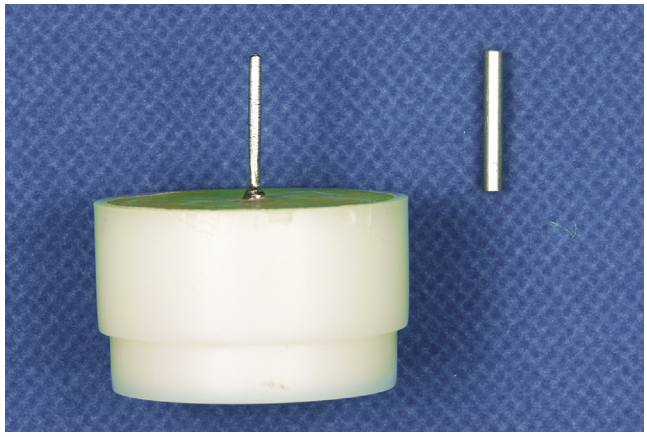

Figure 1. Auxiliary device in 2 parts.

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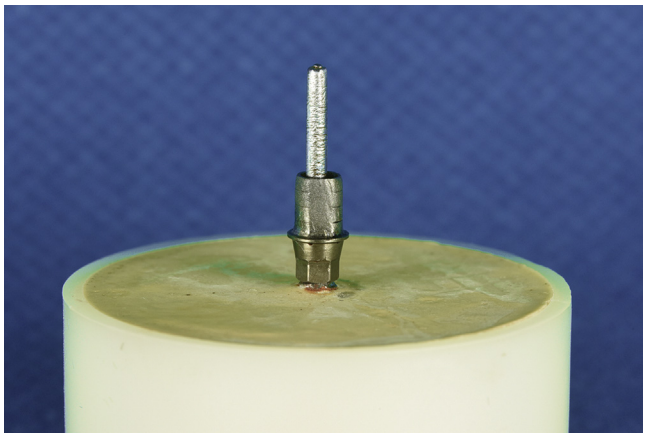

Figure 2. Titanium insert placed over titanium shaft.

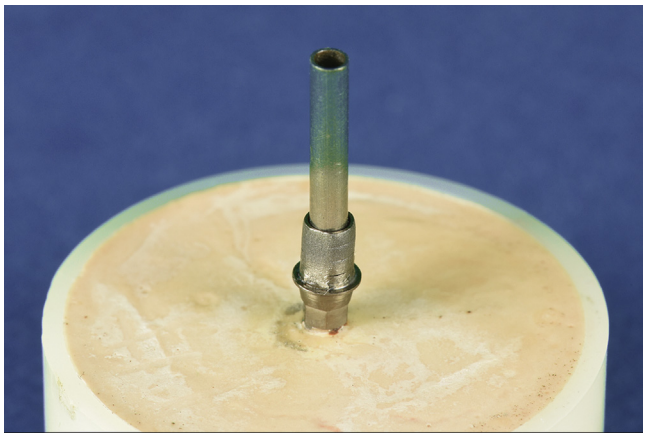

Figure 3. Sleeve passed through intermediate gap between titanium shaft and screw-access opening.

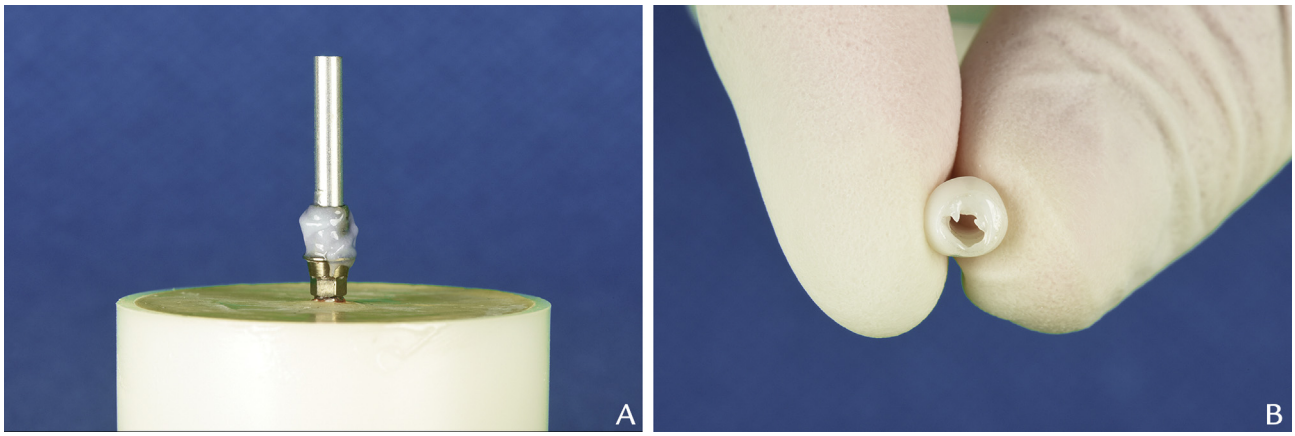

Figure 4. Cement applied. A, To titanium insert. B, To zirconia abutment.

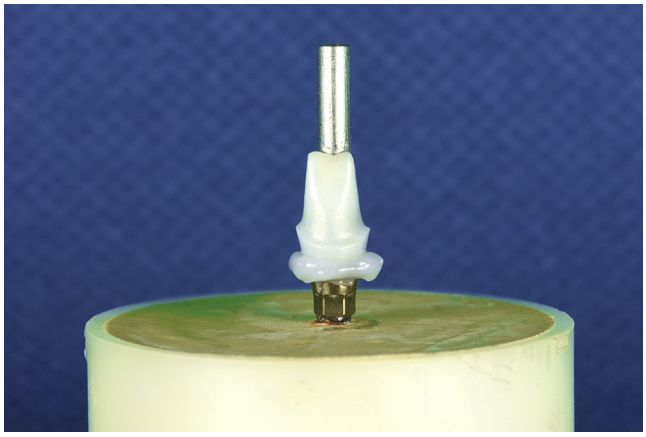

Figure 5. Zirconia abutment seated through sleeve. Abutment and insert bonded together.

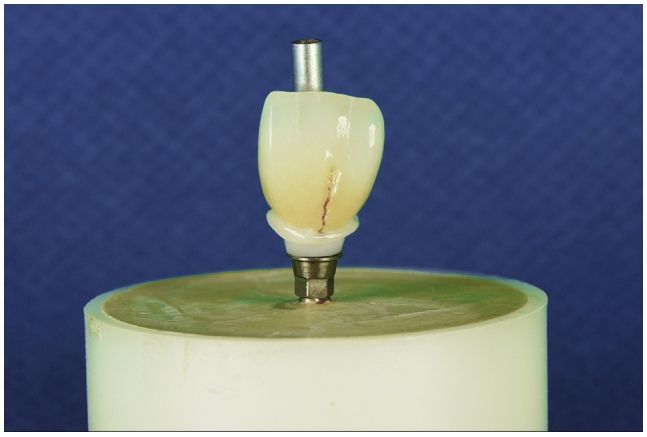

Figure 6. Definitive crown bonded to abutment.

TECHNIQUE

The auxiliary device comprises 2 parts: a base with a vertical titanium shaft and a sleeve that covers the outside of the vertical titanium shaft. The sleeve and shaft are all made of titanium and are milled (Segma-ARUM; Segma) according to the different inner diameters of the SAOs. The internal diameter of the sleeve is kept in clearance to fit over the titanium shaft. The external

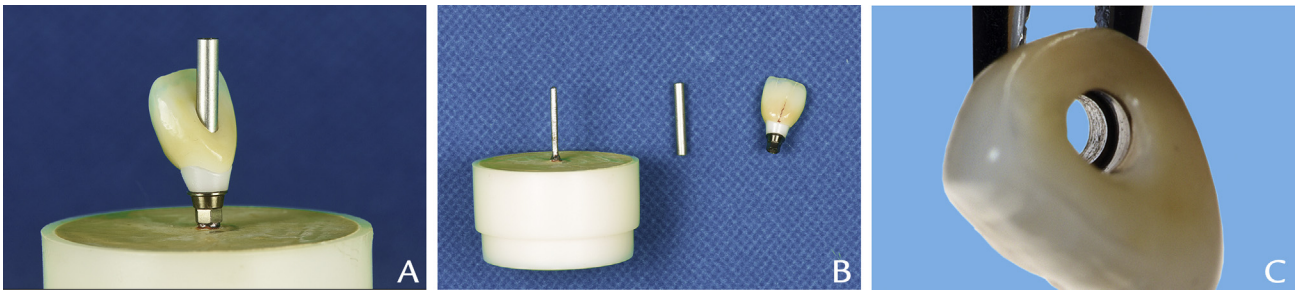

Figure 7. A, Margin cement removed. B, Auxiliary device disassembled. C, Screw-access opening cement-free.

diameter of the sleeve should fit the internal diameter of the SAO closely (Fig. 1).

1. Pass the titanium insert (TS system; OSSTEM) through the titanium shaft until the insert reaches the upper surface of the base (Fig. 2). Pass the sleeve through the intermediate gap between the titanium shaft and the SAO (Fig. 3).
2. Apply luting agent to the bonding region of the titanium insert (Fig. 4A) and the zirconia abutment (MT Zirconia; Upcera) (Fig. 4B). Pass the zirconia abutment through the sleeve and then bond the abutment and the insert together (Fig. 5).
3. Remove the excess cement. Pass the definitive crown into position through the sleeve and then bond the crown and the zirconia abutment together (Fig. 6).
4. Remove the residual cement outside the margin of the crown (Fig. 7A). Separate the sleeve from the titanium shaft and the base (Fig. 7B). No cement should be present on the intaglio wall of the SAO (Fig. 7C).

DISCUSSION

Other methods of preventing residual cement from being left in the SAO include use of polytetrafluoroethylene (PTFE) tape, dental rotary instruments, or cotton applicator sticks have been applied in laboratories to seal the SAO.[9] However, these methods have limitations including that the internal diameters of SAOs differ from system to system. The diameter of dental rotary instruments or cotton applicator sticks may not closely match the internal diameter of the SAO. In addition, the application of PTFE tape may not completely prevent extra cement from intruding into the SAO and may adhere to the PTFE tape, requiring additional clean up time. The device developed in this article can be customized according to different implant systems. The precision machining process ensures the fit of the sleeve to the intaglio wall of the abutment, thus preventing the cement from intruding into the SAO. Moreover, its manufacturing process is straightforward, and production cost is low. In clinical application, this device is easy to operate and is timesaving.

SUMMARY

This article presents a useful auxiliary device for the extraoral bonding process of screw-retained fixed implant restorations. This device will prevent cement from being squeezed into the SAO.

REFERENCES

1. Shadid R, Sadaqa N. A comparison between screw- and cement-retained implant prostheses: a literature review. J Oral Implantol 2012;38:298-307.
2. Priest G. A current perspective on screw-retained single-implant restorations: a review of pertinent literature. J Esthet Restor Dent 2017;29:161-71.
3. Serino G, Hultin K. Periimplant disease and prosthetic risk indicators: a literature review. Implant Dent 2019;28:125-37.
4. Osman R, Swain M. A critical review of dental implant materials with an emphasis on titanium versus zirconia. Materials (Basel) 2015;8:932-58.
5. van Brakel R, Noordmans HJ, Frenken J, de Roode R, de Wit GC, Cune MS. The effect of zirconia and titanium implant abutments on light reflection of the supporting soft tissues. Clin Oral Implants Res 2011;22:1172-8.
6. Wang T, Wang L, Lu Q, Fan Z. Changes in the esthetic, physical, and biological properties of a titanium alloy abutment treated by anodic oxidation. J Prosthet Dent 2019;121:156-65.
7. Kammermeier A, Rosentritt M, Behr M, Schneider-Feyrer S, Peis V. In vitro performance of one- and two-piece zirconia implant systems for anterior application. J Dent 2016;53:94-101.
8. Ebert A, Hedderich J, Kern M. Retention of zirconia ceramic copings bonded to titanium abutments. Int J Oral Maxillofac Implants 2007;22:921-7.
9. Alshehri M, Albaqiah H. Antimicrobial efficacy of materials used for sealing the implant abutment screw hole: an in vitro evaluation. Implant Dent 2017;26:911-4.

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