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Acrylic Resin Guide for Locating the Abutment Screw Access Channel of Cement-Retained Implant Prostheses

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Abstract: Abutment screw loosening represents a common and challenging technical complication of cement-retained implant prostheses. This article describes the fabrication of a simple and accurate poly(methyl methacrylate)

guide for identifying the location and angulation of the abutment screw access channel of a cement-retained implant prosthesis with a loosened abutment screw.

Cement-retained implant prostheses have certain advantages over screw-retained implant prostheses, such as reduced fabrication complexity and costs, better passivity of fit, development of proper occlusal contacts, and superior esthetics.¹ However, one major disadvantage is prosthesis retrievability. This is particularly important when a biomechanical implant failure occurs, such as abutment screw loosening. Screw loosening is a common technical complication,^{2, 3, 4 and 5} with a reported annual incidence rate of 2.1%,⁶ and a 5-year cumulative incidence rate of 8.8%.³ Based on implant connection design, screw loosening has a reported 3-year cumulative incidence of 1.5% for internal connection and 7.5% for external connection designs.⁴

When screw loosening occurs, the implant prosthesis must be removed. This is achieved by sectioning the prosthesis, which will require complete replacement and possibly cause structural damage to the abutment or the implant. The use of interim cements has been recommended,⁷ but this may not result in predictable retrieval of the prosthesis. Retrieval systems using small removable lingual screws^{8 and 9} or rotating levers⁹ have been described but are not popular because of increased fabrication complexity. Other methods that have been used to successfully locate the screw access channel are extraoral and intraoral photography,^{10, 11, 12, 13 and 14} intraoral radiography,^{15 and 16} occlusal ceramic stain to mark the screw access location,¹⁷ different types of templates,^{18, 19, 20, 21, 22 and 23} and computer-aided design/computer-aided manufacture (CAD/CAM) technology.^{20 and 24} Most of these techniques do not provide 3-dimensional information, as they show only the location and not the angulation of the screw access channel.^{10, 11, 12, 13, 15, 16, 17, 18, 19 and 21} Some techniques require access to specialized equipment or may be impractically expensive.^{20 and 24} Other techniques describe the fabrication of a template from a combination of different materials, which may result in a template with compromised fit or integrity that cannot be used predictably.^{22 and 23}

The purpose of this article was to describe a technique for the fabrication of a poly(methyl methacrylate) (PMMA) guide to identify the abutment screw access channel in a cement-retained implant crown with a loosened abutment screw. This technique uses a thin drill that can fit into the implant analog connection and subsequently transfer the screw channel location and angulation to the acrylic resin guide. It is simple and inexpensive and results in an accurate, precise, and durable guide. This technique could also be used with multiple unit implant partial fixed dental prostheses. A disadvantage of the described technique is that it can be used more successfully with implants that have an internal connection design. Also, the original implant analog cast must be preserved. However, this problem may be overcome if the screw access guide is fabricated before the cementation of the implant prosthesis and retained for future use.

Technique

1. Locate the implant prosthesis with the loosened abutment screw (Fig. 1) and make an irreversible hydrocolloid impression (Jeltrate; Dentsply Intl) of the pertinent arch. Pour the impression in type 3 dental stone (Microstone; Whip Mix Corp). Trim the cast, leaving 1 to 3 teeth on each side of the loosened implant prosthesis.



Figure 1. Cement-retained gold implant crown on maxillary right first molar with loosened abutment screw.

2. Survey the trimmed cast and mark the height of contour.

3. Mold silicone laboratory putty (GCLT Laboratory Putty; GC America) over the cast and cut the excess material at the height of contour leaving the material below the height of contour on the cast (Fig. 2).

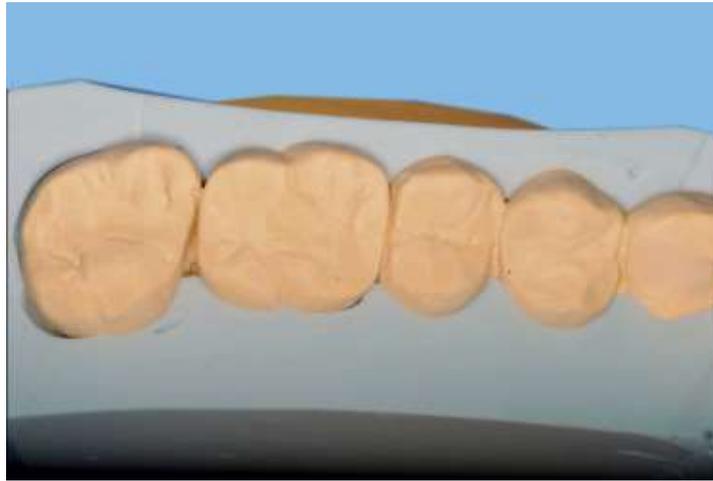


Figure 2. Silicone laboratory putty blocking tooth surfaces apical to their height of contour on cast.

4. Box the cast (Modern Materials Boxing Wax; Heraeus Kulzer North America) and apply petroleum jelly (Vaseline; Unilever) (Fig. 3).



Figure 3. Cast and silicone putty block-out boxed with wax and lubricated with petroleum jelly.

5. Mix clear autopolymerizing PMMA material (Splint Resin; Great Lakes Orthodontics) and pour it on the boxed cast (Fig. 4). Place in a pressure pot at 0.14 MPa for 15 minutes.



Figure 4. Mixed autopolymerizing poly(methyl methacrylate) poured into boxed cast.

6. Trim and polish the polymerized guide leaving approximately 3 to 5 mm of material thickness above the occlusal surfaces.
7. Place the PMMA guide over the original analog cast from which the implant prosthesis was fabricated and ensure it is stable.
8. Place the cast on the surveyor table on a drill press. Mount a 2-mm-diameter drill on the drill press. Adjust the table so that the drill is aligned to and fits into the connection channel of the implant analog and tighten the surveyor table screw. Use a narrower drill if necessary (Fig. 5).



Figure 5. Original implant analog cast on surveyor table on drill press. Drill aligned to long axis of implant analog.

9. Place the PMMA guide on the cast and drill through the guide (Fig. 6).



Figure 6. Poly(methyl methacrylate) guide positioned over original cast on drill press. Drill has been driven through guide.

10. Place the PMMA guide intraorally. Drill through the crown with a #6 round tungsten carbide bur (000093U4; Brasseler USA) until the screw access channel is reached (Fig. 7). Remove the crown and custom abutment assembly.



Figure 7. Cement-retained prosthesis accessed with poly(methyl methacrylate) guide and round tungsten carbide bur.

11. Reposition the crown intraorally and replace and tighten the abutment screw to the recommended torque. Cover the cervical portion of the screw access channel with polytetrafluoroethylene (Teflon; DuPont) tape. Restore the coronal 3 mm of the screw access channel with an appropriate restorative material. Evaluate the occlusion and polish (Fig. 8).



Figure 8. Coronal aspect of screw access channel was restored with amalgam after abutment screw was replaced and tightened.

Discussion and Summary

Abutment screw loosening is a common technical complication of implant prostheses. This article describes a straightforward and inexpensive method of fabricating a clear PMMA guide that transfers the implant long axis location in order to access the abutment screw channel accurately and precisely. The cement-retained prosthesis and abutment could be removed in one piece without damage. Alternatively, this guide could be fabricated before inserting the implant prosthesis in case a technical complication occurs.

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