

Composite resin root coping with a keeper for magnetic attachment for replacing the missing coronal portion of a removable partial denture abutment

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Numerous methods for replacing missing removable partial denture abutments have been introduced, however, most of them are time consuming and require several visits to complete the procedure. Since magnetic attachments can provide support and bracing as well as retention for overdenture abutments, the remaining tooth root structure can be used to support the coping with the keeper. Through the use of composite resin and adhesive material, improved retention of the keeper to the root may be achieved, along with improved esthetics. This article describes a method for replacing the missing abutment of a removable partial denture with a magnetic attachment, and a composite resin coping with a keeper. (*J Prosthet Dent* 2006;96:139-42.)

Numerous methods have been suggested to replace missing removable partial denture (RPD) abutments, however, most of them are time consuming and require several visits to complete the procedure.¹⁻⁵ Moreover, those abutments may be periodontally involved and also have poor crown-to-root ratios. Rather than replacing the missing crown, use of a magnetic attachment with a keeper on the root surface is an option⁶⁻⁹ that can provide adequate retention and support on the same day or within a relatively short period of time when composite resin is used for the coping.

Magnetic attachments were introduced in the early 1980s with approximately 3 N of retentive force for a magnet. Since then, magnet materials have been improved, and more than 9 N of retentive force can be expected from the new generation of magnetic attachments.¹⁰ Problems with early magnetic attachments, such as corrosion and deterioration, have also been solved with the use of laser-welded housing and coating systems.⁹⁻¹² The advantages of using magnetic attachments to replace missing crowns with root-keeper systems are the adequate retentive force available, the minimum space requirement, and the efficient dissipation of the lateral stress component from the occlusal load onto the abutment tooth.¹³

As for the root coping with the keeper for magnetic attachment, metal and composite resin materials are available. Advantages of using composite resin rather than cast metal copings are: (1) easy fabrication procedure with decreased cost, (2) better retention of coping to the remaining tooth structure using adhesive resin primers, which may not cause root fracture as in the post-and-core foundation of a crown using a long post in the root canal,¹⁴ (3) enhanced esthetics, and (4)

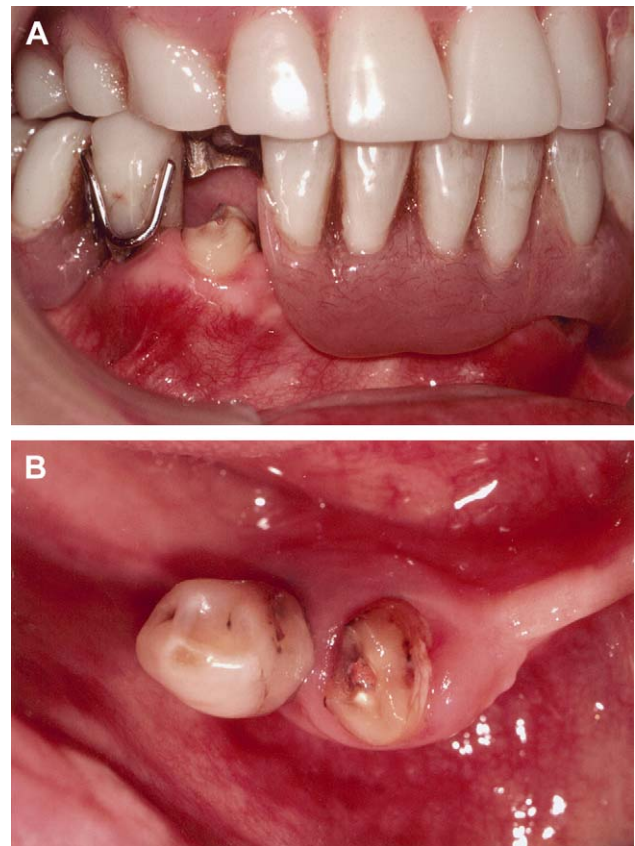


Fig. 1. A, Partial denture with missing abutment crown. B, Prepared abutment tooth surface.

elimination of distortion of the magnetic keeper during the casting process—a factor responsible for decreasing the retentive force of the magnet. Disadvantages of composite resin root coping are abrasion of the surface, and periodontal tissue inflammation due to coverage by the denture base and reduction of the self-cleaning effect of salivary flow. These disadvantages may be overcome by the establishment of a periodical maintenance program, as described for overdentures.^{15,16}

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Fig. 2. Composite resin artificial tooth on prepared abutment.



Fig. 4. Completed composite resin coping with root keeper.

The retention of magnetic attachments depends directly on the intimate contact between magnet and keeper surface. The lack of retention or decrease in retention usually arises from the air gap formation between magnet and keeper caused by distortion of resin material or misalignment of the magnet during the magnet placement procedure. This article describes a procedure for replacing the missing abutment of an RPD with a magnetic attachment and composite resin coping with a keeper.

TECHNIQUE

1. Prepare the remaining root surface of the abutment with a diamond and silicone rotary instrument (Diamond point FG106RD, White point FG57; Shofu, Kyoto, Japan), producing a chamfer margin (Fig. 1, A). Remove the root canal filling material with a stainless rotary instrument (Peasow reamer; Dentsply, York, Pa) to accommodate the root keeper (Root keeper; Aichi Steel Co, Aichi, Japan) (Fig. 1, B). Select a root keeper of the proper size.

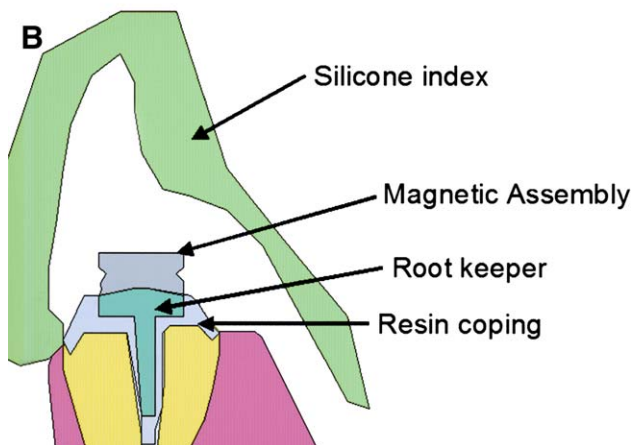
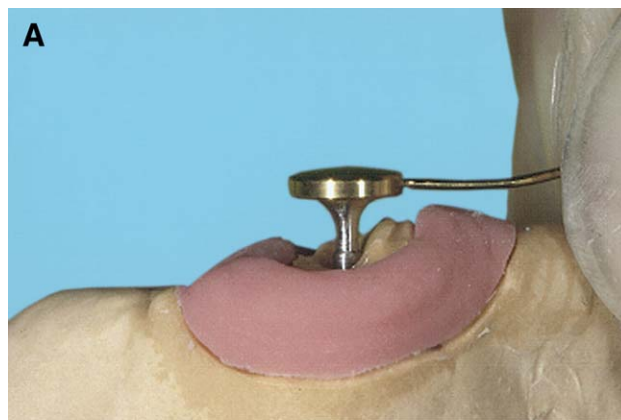


Fig. 3. A, Placement of the root keeper. B, Cross-section of resin root keeper coping.

Shorten the length of the post by cutting with a wire cutter (KI type YS602; YDM Co Ltd, Tokyo, Japan), if necessary.

2. Make an impression of the prepared root surface and canal using a heavy-bodied and regular-type silicone impression material (Examix and Exaflex; GC Corp, Tokyo, Japan). Make the impression, covering at least 1 other abutment tooth to facilitate fabricating the root coping in relation to the path of insertion of the partial denture. Make an impression of the RPD in position using heavy-bodied silicone impression material (Examix; GC Corp) to create an index.
3. Fill the index in the areas of the abutment with the missing crown with the proper shade of composite resin (Gradia; GC Corp) and place on to the prepared abutment tooth. Remove the index, trim the composite resin, and form the proper artificial tooth shape with a hand instrument (Composite resin instrument CP-3; YDM Co Ltd).
4. Polymerize the composite resin with a light-emitting diode (LED) light source (G-Light; GC Corp), wave length 465 to 475 nm, for 10 seconds, to form the artificial teeth. Ensure the adhesion of

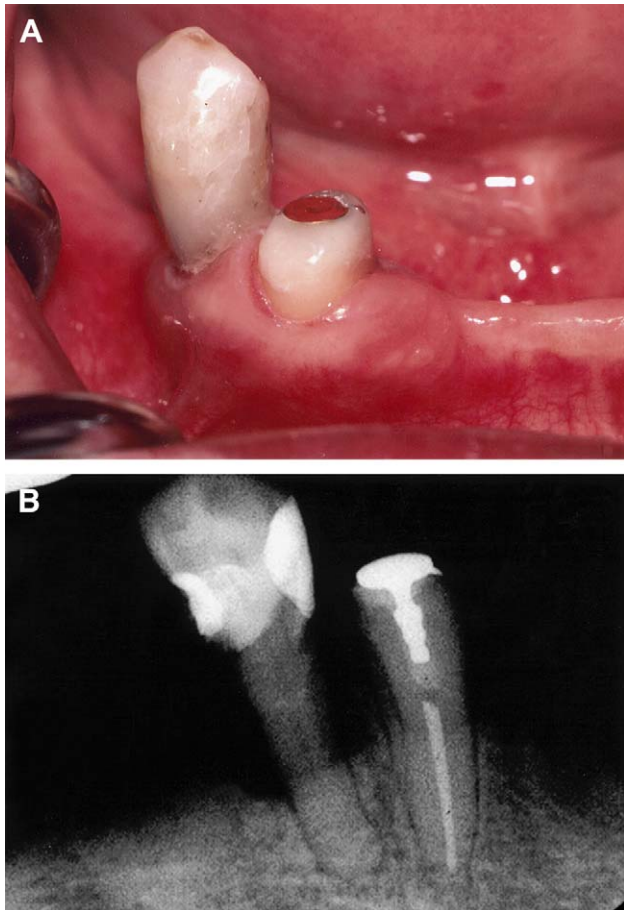


Fig. 5. **A**, Cemented root keeper. **B**, Periapical radiograph of abutment with the coping.

the newly formed artificial teeth to the existing partial denture (Fig. 2).

5. Add a different silicone impression material (Soft tissue Moulage; Kerr Corp, Orange, Calif) to the impression to create an artificial gingival. Then pour the impression with type III stone (Fujirock; GC Corp) to fabricate the final cast.
6. Place the root keeper on the die (Fig. 3, A). Verify with the silicone index that there is adequate space for both the magnet and artificial teeth (Fig. 3, B). Select the proper-size magnet in terms of both height and width.
7. Treat the post part of the root keeper with airborne-particle abrasion (50- μ m, High-alumina; Shofu) and the adhesive resin primer (Superbond; Sun Medical Co, Moriyama, Japan).
8. Inject a dual-polymerizing composite resin (GC UniFil Core; GC Corp) into the post space using a needle syringe (CR syringe F type; YDM Co Ltd) and place the root keeper into the proper position.
9. Trim the composite resin area between the root keeper and composite resin, as well as composite and marginal root surface, with a hand instrument



Fig. 6. Magnet placed on keeper.



Fig. 7. Intaglio surface of repaired RPD.

(Composite resin instrument CP-3; YDM Co Ltd), and then polymerize (G-light; GC Corp) the composite resin.

10. Remove the polymerized composite resin root coping from the final cast and trim the margin with a rotary instrument. Add additional composite resin as needed to correct the shape (Fig. 4). Polish and finish the root coping with the polishing discs (Super-snap; Shofu) and place back into the abutment.
11. Cement the keeper to the root with dual-polymerizing resin cement (Unifil core; GC Corp) (Fig. 5). Polish the margins with a composite resin polishing kit (Super snap; Shofu).
12. Treat the magnet surface (Magfit 600; Aichi Steel Co) opposing the denture base with resin primer (Superbond; Sun Medical Co) to fix the magnet to the denture base.
13. Lubricate the contacting surface between the magnet and the root keeper with a separating medium (Acrosep; GC Corp), and assemble the magnet and root keeper on the abutment (Fig. 6).

14. Adjust the intaglio surface of the composite resin artificial tooth to accommodate the magnet. Make the escape hole from the intaglio surface to the polishing surface.
15. Add dual-polymerizing type resin cement material (Unifil core; GC Corp) to both the magnet and denture base. Place the RPD into position and complete a second polymerization after the initial polymerization with the light source (G-Light; GC Corp) for 10 seconds.
16. Remove the RPD and evaluate the retention (Fig. 7). Remove the magnet from the denture base and realign the magnet to the keeper intraorally, using the dual-polymerizing type resin cement material if the retention is not adequate.

SUMMARY

As a method to replace the missing coronal portions of RPD abutments, magnetic attachments and composite resin root copings with a keeper provide adequate retention, support, bracing, and improved esthetics in a short period of time.

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