A Technique for Retrofitting a Metal Ceramic Crown to an Attachment-Retained Removable Partial Denture: A Clinical Report

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Abstract
In dental applications, precision attachments have been used to retain removable partial dentures (RPDs) for several decades. Various types of extracoronal attachments are commonly used in combination with fixed partial dentures and RPDs to achieve retention and stability. Framed fracture, fracture of the roots or teeth, and irretrievable decrease of retention are common reasons for a failed attachment-retained RPD. Another complication of metal ceramic crowns with precision attachment is decementation of the crowns. Although retrofitting of crowns to existing RPDs has been well documented, including fabrication of direct resin copings on the abutment teeth, making resin replicas of the clasp assemblies, or using CAD/CAM technology, no information regarding retrofitting of crowns to existing attachment-retained RPDs has been documented. Common clinical protocol requires remaking both fixed and removable components of an attachment-retained RPD. This article describes a method whereby a metal ceramic crown can be retrofitted to a resilient attachment-retained RPD.

Clinical report
A 70-year-old man was referred to the Department of Prosthodontics, Faculty of Dentistry, University of Ankara (Ankara, Turkey) for evaluation. In the initial clinical examination, attachment-retained distal extension RPDs were noted for both dental arches. The mandibular RPD was supported by mandibular left and right canines. The metal ceramic crown of the mandibular right canine was missing. The patient stated that the RPD had been in service for 2 years without any complaints. The patient had not experienced any previous decementation of the metal ceramic crown on the mandibular right canine, which was noted to be sound with no clinically detectable mobility. The RPDs were observed to have acceptable occlusion and esthetics. No periodontal or periapical lesions were present in the radiographic examination. Previous dental records were obtained from the previous dental office where the existing RPDs were fabricated. These records indicated that the attachment system used to retain the RPD was the resilient rk-1 attachment system (rk-1; Kargı Sağlık, Bursa, Turkey; Fig 1). Castable extracoronal rk-1 attachments are resilient and permit a hinging movement limited to 17° of the distal extension RPD. These attachments have plastic patrices and matrices. The castable patrix is attached to the crown pattern with a paralleling mandrel, and the matrix is incorporated into the cast framework using inserting tools.

Because current clinical knowledge requires splinting of at least two terminal abutment teeth to retain an extension-base, attachment-retained RPD, the patient was offered a new treatment plan including remaking of a new attachment-retained mandibular RPD after tooth preparation of the
remaining mandibular arch. The patient rejected the treatment plan because of the prolonged treatment period and asked about the possibility of retrofitting of the lost metal ceramic crown to the existing RPD. A new treatment plan, including fabrication of a resin pattern and castable attachment patrix assembly to form the substructure of the metal ceramic crown on the definitive cast, was developed and accepted by the patient.

Impression of the maxillary arch was made with irreversible hydrocolloid (CA37; Cavex Holland B, Haarlem, The Netherlands) using a stock tray (Teknik Dis Deposu, Istanbul, Turkey). Low-viscosity poly(vinyl siloxane) impression material (Mucosa Xantopren; Kulzer, Hanau, Germany) was applied to the intaglio surfaces of the mandibular RPD, which was placed intraorally. The final seat of the mandibular RPD was verified by visually inspecting the position of the left reciprocating arm of the RPD with the milled lingual surface of the same attachment-retained metal ceramic crown on the mandibular left canine (Fig 2). The patient was instructed to apply slight occluding force in maximum intercuspal position. Low-viscosity elastomeric impression material (Speedex; Coltene/Whaledent Inc, Cuyahoga Falls, OH) was injected around the mandibular right canine, and a pick-up impression of the mandibular RPD was made in a rigid stock tray with heavy-body elastomeric impression material (Speedex; Fig 3). Type IV stone (BEGO, Bremen, Germany) was poured into the impression.

Figure 1 View of the patrix and matrix of the rk-1 castable attachment.

Figure 2 Intraoral view of the denture in the mouth.

Figure 3 Mandibular prosthesis impression.

Figure 4 Resin pattern and castable attachment patrix assembly on the master model.

Figure 5 View of attachment matrix in the mandibular RPD.

After forming a resin pattern to fabricate the substructure of the metal-ceramic crown (Fig 4), a castable attachment patrix was incorporated with the matrix on the RPD framework (Figs 5 and 6). The castable attachment patrix was incorporated in the resin pattern with sticky wax (Keystone Industries GmbH, Singen, Germany). The resin pattern and castable attachment patrix assembly was cast with a chrome-cobalt alloy (Biosil F; Degudent, Hanau, Germany; Fig 7) and was verified intraorally.
Discussion

Attachment-retained RPDs may fail due to decementation of the fixed components, which may be associated with geometry of the tooth preparations as well as the geometry of the restorations and improper cementation techniques. When the fixed components of an attachment-retained RPD fail, the traditional treatment approach requires remaking of both fixed and removable components of the attachment-retained RPD. This clinical report describes retrofitting of a metal ceramic crown to a resilient attachment-retained RPD by using a resin pattern and castable attachment patrix assembly to form the substructure of
the metal ceramic crown. Advantages of this technique include decreased chair time and treatment cost, as well as increased patient satisfaction compared to remaking of both fixed and removable components of the attachment-retained RPD. The increased technical sensitivity is a disadvantage of this technique. Proper impression techniques and the careful incorporation of the matrix assemblies are the key factors determining the outcome of the described technique. Well-documented clinical studies are required to determine long-term results of this technique.

**Summary**

Several reasons for failure of combination FPDs and RPDs include fracture of the framework, fracture of the roots or teeth, irretrievable decrease of retention, and decementation of the fixed components, which may eventually be lost. Although retrofitting of crowns to existing RPDs has been well documented, no information regarding retrofitting of crowns to existing attachment-retained RPDs has been documented. Common clinical protocol requires remaking of both fixed and removable components of an attachment-retained RPDP. This article describes a method whereby a metal ceramic crown can be retrofitted to a resilient attachment-retained RPD.

**References**