



# A Resin-Bonded Overcasting With Highly Filled Composite Resin to Salvage a Broken Metal-Ceramic Fixed Partial Denture: A Case Report

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**ABSTRACT** A resin-bonded overcasting made of a silver-palladium-copper-gold alloy with highly filled composite resin was fabricated to salvage a broken metal-ceramic fixed partial denture using a metal conditioner, a silane coupling agent, and an adhesive resin luting cement. This resin-bonded overcasting has been functioning satisfactorily for more than nine years without any problems. The longevity of the fixed partial denture was enhanced through the use of this treatment.

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**W**hen a fixed partial denture or a continuous multiple restoration fails due to porcelain fracture, ideally the entire prosthesis should ideally be removed and a new one fabricated. Although replacement is preferred, it may not be possible for some patients due to the cost and the treatment time involved.

The overcasting technique is a useful and practical option that does not require the removal of the existing prosthesis.<sup>1-5</sup> The procedure to fabricate a repair device

to be used without removing adjacent existing cast restorations was reported.<sup>6</sup> This article describes the application and a nine-year clinical follow-up of a resin-bonded overcasting restoration to salvage a fixed partial denture with a broken metal-ceramic pontic. This procedure was accomplished using a metal conditioner, a silane coupling agent, and an adhesive resin luting cement.

## A Case Report

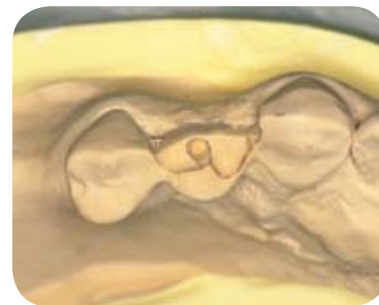
A 64-year-old woman presented with the chief complaint of poor esthetics



**FIGURE 1.** Fractured porcelain pontic on the fixed partial denture.



**FIGURE 2.** Preparation of pontic for an overcasting restoration.



**FIGURE 3.** Definitive cast.

resulting from a fractured porcelain on a maxillary right fixed partial denture. The broken maxillary right first premolar served as the pontic of the three-unit metal-ceramic fixed partial denture (**FIGURE 1**). Removal of the entire prosthesis and the fabrication of a new one was proposed as the most reliable solution, but she did not accept such a large-scale treatment and preferred a less lengthy procedure. Therefore, restoration of the pontic using an overcasting restoration instead of completely replacing the denture was suggested and she agreed.

The buccal and occlusal surfaces of the pontic were prepared by removing the residual porcelain so that no undercut remained and then placing the overcasting. A diamond rotary instrument with a central pinhole in the occlusal plane was used for mechanical retention (**FIGURE 2**). An impression was made with a silicone elastomeric material (Exafine injection/putty type, GC Corp., Tokyo, Japan), and a definitive cast was prepared (**FIGURE 3**). A wax pattern was fabricated, sprued, and invested using cristobalite mold material. A silver-palladium-copper-gold alloy (Castwell MC 12, GC Corp.) was cast in the mold by means of a centrifugal casting machine. A laboratory processed composite resin material (Cesead II opaque, dentin and enamel, Kuraray Medical Inc., Tokyo, Japan) was applied to the casting in a light-polymerizing unit (UniXS II, Heraeus Kulzer GmbH, Wehrheim,

Germany) in accordance with the manufacturer's instructions<sup>7</sup> (**FIGURE 4**).

The overcasting restoration was tried-in, adjusted, and polished. The intaglio surface to be bonded was airborne-particle abraded with 50  $\mu$ m aluminum oxide particles (Aluminous Powder WA 360, Pana Heraeus Dental Inc., Osaka, Japan) using an airborne-particle abrasion unit (Micro Blaster MB102, Comco Inc., Burbank, Calif.). Immediately before insertion, a metal conditioner (Alloy Primer, Kuraray Medical Inc.) was applied to the intaglio surfaces of the metal part of the overcasting restoration. A silane coupling agent (Porcelain Liner M, Sun Medical Co., Ltd., Moriyama, Japan) was carefully applied to the narrow intaglio surfaces of the indirect composite resin material.

The prepared metal surfaces of the pontic were cleaned with pumice, rinsed, airborne-particle abraded with 50  $\mu$ m aluminum oxide particles using an intraoral portable airborne-particle abrasion unit (Micro-etcher ERC, Danville Engineering, San Ramon, Calif.). The alloy primer was applied and the overcasting cemented using an adhesive luting agent (Super-Bond C&B Ivory, Sun Medical Co., Ltd.) (**FIGURE 5**). The patient was placed on a maintenance program. The resin-bonded overcasting restoration has been functioning satisfactorily for more than nine years, although the surface of the composite resin has lost its luster, and plaque accumulation has caused gingival inflammation under the pontic (**FIGURE 6**).

## Discussion

The overcasting technique was originally designed specifically to avoid the removal of restorations, such as fractured metal-ceramic fixed partial dentures.<sup>1-5</sup> In the present situation, the metal used to fabricate the fixed partial denture was unknown since the denture had not been fabricated in the authors' hospital, whereas the overcasting restoration was made of a silver-palladium-copper-gold alloy with a highly filled indirect composite resin material. There were three kinds of surfaces to be bonded: the metal surface of the prepared pontic, the intaglio surfaces of the metal, and the indirect composite resin material of the overcasting restoration. The alloy primer contained both the thione monomer (VBATDT) to be used for precious alloys and the hydrophobic phosphate monomer (MDP) designed for base metal alloys in methyl methacrylate.<sup>8-12</sup>

Therefore, the use of this metal conditioner was a reasonable choice for this situation because it is applicable to any type of dental alloy. Porcelain Liner M, whose major component is 3-trimethoxysilylpropyl methacrylate in methyl methacrylate, was originally used to repair fractured porcelain facings without removing the prostheses.<sup>13</sup> This silane coupling agent was applied in the present situation to enhance the bond strength between the filler of the indirect composite material and the adhesive luting agent. It may be possible now to use a highly filled all-composite restoration instead of a metal



**FIGURE 4.** Intaglio surface of the overcasting restoration.



**FIGURE 5.** Cemented overcasting restoration.



**FIGURE 6.** Lateral view of fixed partial denture after nine years.

framework with composite resin veneer.

The combination of a small bonding surface area and insufficient retentive features often leads to debonding of resin-bonded fixed prostheses. Therefore, a retentive pin was strategically placed to improve retention in the overcasting restoration.<sup>1,14-16</sup> Consequently, this structure helped prolong the service period of the overcasting.

## Conclusion

The overcasting made of a silver-palladium-copper-gold alloy with composite resin veneer using a metal conditioner, a silane coupling agent and an adhesive resin luting cement is one of the treatment options that can be used to repair fractured porcelain on a metal-ceramic fixed partial denture. ■■■■■

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