Repair of a resin-bonded fixed partial denture 16 years after seating: a case report

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This article describes the clinical course of a repaired resin-bonded fixed partial denture (RB-FPD). A posterior FPD cast from silver-palladium-copper-gold alloy (Castwell M.C. 12) was applied to a 27-year-old male patient. A three unit FPD with wrap-around retainers was fabricated. After try-in, the framework surface to be bonded was air-abraded with alumina. The FPD was then treated with a single liquid priming agent (V-Primer), and bonded with a tri-*n*-butylborane (TBB) initiated adhesive resin (Super Bond Opaque). Sixteen years after seating, fracture of the molar abutment occurred at the bucco-distal cusp and distal marginal ridge around and under the retainer. The fractured area was reduced with a diamond rotary cutting instrument and an inlay cavity was prepared. The cavity preparation was restored with the same system as the RB-FPD. After an observation period of 23 years and six months, the original FPD was functioning satisfactorily. The materials and bonding technique reported here are applicable as an option for a minimally invasive fixed prosthodontic treatment.
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Key Words: adhesive, alloy, primer, resin-bonded fixed partial denture, repair

Introduction

Seating posterior resin-bonded fixed partial dentures (RB-FPD) has been covered by the Japanese social insurance system since April 1, 2012. Combination of a single liquid primer (V-Primer; Sun Medical Co., Ltd., Moriyama, Japan) and a tri-*n*-butylborane (TBB) initiated adhesive resin (Super-Bond C&B, Sun Medical Co., Ltd.) is being extensively applied for seating RB-FPDs made of silver-palladium-copper-gold (Ag-Pd-Cu-Au) alloys. Both laboratory and clinical evaluations demonstrated improved bonding durability of the bonding system.[1-13] Although more than 20 years have passed since the development of the V-Primer material, only limited information is available about the long-term clinical course of RB-FPDs seated with the Super-Bond system. This report describes the clinical course of a RB-FPD once repaired 16 years after placement, and functioning for more than 23 years.

Clinical Report

A 27-year-old male patient presented with functional disturbances as a result of a missing mandibular left first molar. The patient had undergone extraction of first molar due to chronic apical periodontitis and root fracture (Fig. 1). Several treatment options were proposed: 1) single-tooth implant; 2) removable partial denture (RPD); 3) conventional FPD with considerable tooth reduction; and 4) RB-FPD with minimal tooth reduction. The patient chose the fourth of the proposed options. The prosthodontic procedure was then explained in detail and consent was obtained from the patient.

Fabrication of a RB-FPD with wrap-around retainers was planned. Intercuspal position and lateral mandibular movement were examined intraorally with articulating paper and extraorally using a stone cast. The examination revealed that the occlusal pattern for this patient was a cuspid-protected occlusion. Reduction of cusps was judged as unnecessary. Pits and fissures, proximal surfaces, and lingual surfaces within the enamel of abutment teeth were reduced using a diamond rotary instrument (Fig. 2). A FPD consisting of two retainers and a pontic

was cast from a Ag-Pd-Cu-Au alloy (Castwell M.C. 12, GC Corp., Tokyo, Japan).

The completed FPD was tried-in at the next appointment. The surfaces to be bonded of the retainers were air-abraded with 50- to 70-μm grain sized alumina (Hi-Aluminas, Shofu Inc., Kyoto, Japan) using an airborne particle abrader (Hi-Blaster, Shofu Inc.). A single liquid primer (V-Primer, Sun Medical Co., Ltd.) was applied to the blasted surfaces (Fig. 3). The abutment enamel surfaces were etched with 40% phosphoric acid gel (K-Etchant, Kuraray Co., Ltd., Osaka, Japan), washed with water, and air-dried (Fig. 4). The FPD was then seated (Fig. 5) with a tri-*n*-butylborane (TBB) initiated adhesive resin (Super Bond Opaque, Sun Medical Co., Ltd.). The patient then entered a maintenance program (Fig. 6).

After a service period of 16 years, the bucco-distal cusp and distal marginal ridge of the second molar abutment fractured within the range of enamel (Fig. 7). Recurrent dental caries under the bonded retainer was not detected (Fig. 8). A disto-occlusal cavity preparation was performed, and an inlay restoration made of the Castwell alloy was seated with the same system as applied to the FPD. The originally seated FPD has been functioning satisfactorily for more than 23 years and six months (Fig. 9).

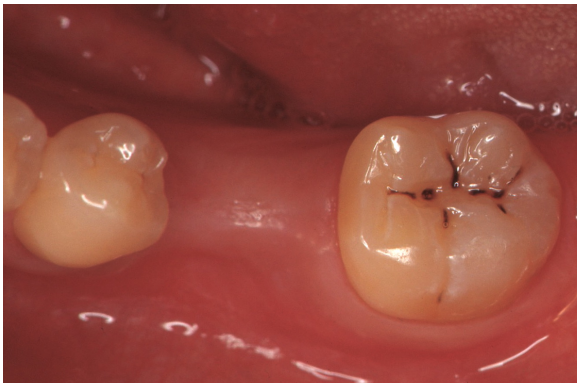

Fig. 1. Missing mandibular fist molar

Fig. 2. Reduction within enamel for RB-FPD

Fig. 3. Primed retainers after alumina air-abrasion

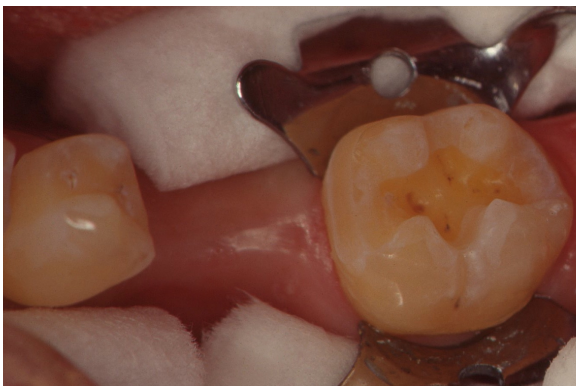

Fig. 4. Etching enamel with 40% phosphoric acid

Discussion

Retainers of conventional FPDs are made of full-veneered restoration. Repair of FPDs therefore has been limited to fractured facing area or soldered joint. Due to minimally reduced abutment structure, enamel fracture sometimes occurs especially around the centric holding cusps. Examination of the fractured area revealed that bonding between the molar retainer and the abutment tooth was satisfactory. Dislodgement of the retainers was

not necessary. Reduction including occulusal area of the cast retainer was performed to form an OD inlay cavity. This repair procedure is similar to the technique of overcasting as well as conventional inlay restoration.[1,4,8,11,12]

Fig. 5. The FPD seated with the Super-Bond resin

Fig. 6. Occlusal view 10 years after seating

Fig. 7. Enamel fracture occurred 16 years after bonding the retainer.

Fig. 8. Bonding between the retainer and the remaining abutment appeared to be strong.

Fig. 9. Occlusal view 23 years and six months after seating the FPD, and seven years and six months after repairing the RB-FPD

Both enamel and dentin structure of the second molar abutment was minimally reduced. During the service period of the FPD for more than 20 years, recurrent dental caries was not detected. The authors consider that the

RB-FPD system and repair procedure described here is one of the best options for patients whose caries risk level is substantially low.

As reported in the literature,[13] metal adhesive systems that consist of thione-based primer and TBB resin are extremely effective for bonding Ag-Pd-Cu-Au alloy. The RB-FPDs fabricated and bonded with the materials described in this report demonstrate favorable prognosis as long as indications of the cases are properly informed to the patients, clinicians, and dental technicians.

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