

Repair and re-seating of resin-bonded fixed partial denture performed after minimal abutment reduction: A clinical report

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This clinical report describes repairing and re-seating of a resin-bonded fixed partial denture placed in a patient suffering from periodontitis as well as leukemia. A mandibular seven-unit fixed partial denture (FPD) made of type IV gold alloy was seated in a 62-year-old male patient with an adhesive resin. Five years and two months after seating, two retainers detached probably due to labial inclination of the abutments. Two retainers were cut with a diamond rotary instrument, and the fractured composite veneer was repaired extraorally. The abutments were minimally reduced to remove the adhesive resin remnant. The repaired five-unit cantilever FPD was re-seated with a combination of the Metaltite primer and the Super-Bond Opaque resin. The FPD and abutments have been functioning satisfactorily for more than six months. (*Int Chin J Dent* 2005; 5: 97-100.)

Key Words: adhesive, indirect composite, primer, repair, resin-bonded fixed partial denture.

Introduction

Resin-bonded fixed partial dentures (FPDs) and splinting devices are seated generally to abutments with sufficient enamel structure. Clinicians frequently encounter cases indicated for FPD or splint especially in the mandibular anterior dentition. It is desirable for patients to keep the reduction of tooth structure to a minimal level during preparation of vital abutment teeth. Several types of noble metal adhesive systems have been developed during the last decades,¹⁻⁸ and resin-bonded castings made of noble metal alloys are widely employed as alternatives to base metal alloy castings.⁹⁻¹⁶

Prostheses made of noble metal alloys have several advantages over those made of base metal alloys, i.e., improved adaptation to abutments, adequate mechanical properties after age-hardening, adjustability of maxillo-mandibular occlusal contact, and polishability. Limited information, however, is available regarding bonding systems, clinical outcome, and techniques to repair or re-seat of such FPDs and splints. This clinical report describes the procedure of repairing and re-seating of a fractured and once detached resin-bonded FPD in conjunction with minimal intervention to abutment tooth structures.

Clinical Report

Fabrication and seating of the original FPD

A 62-year-old male patient presented with the chief complaint of masticatory disturbance derived from mobility of mandibular anterior and posterior teeth. The patient suffered from periodontitis and leukemia. After extraction of mobile teeth and initial preparation of periodontal tissue under hemostatic control, the patient preferred prosthodontic treatment with a resin-bonded FPD. Figs. 1 and 2 show the post-extraction and pre-operative view of the mandibular anterior dentition. There was a remarkable increase in crown/root ratio associated with gingival recession. Application of a conventional FPD with full-coverage casting and dental implants appeared to be difficult in this case. Fortunately, the mobility of abutments was within the range of grade I.



Figs. 1 and 2. Pre-operative lateral and frontal views.



Fig. 3. Metal framework of the FPD.



Fig. 4. Occlusal view of the FPD.



Figs. 5 and 6. Seven-unit FPD seated with Metaltite and Super-Bond.



Fig. 7. Fracture of the pontic veneer.



Figs. 8 and 9. Adhesive-cohesive failure of the Super-Bond resin.



Fig. 10. Dislodged FPD.



Figs. 11 and 12. Frontal and occlusal views of the re-seated FPD.

The mandibular central incisors, right canine, and first premolar were missing. The left canine, lateral incisors, and right second premolar were selected as abutment teeth. Tooth reduction was limited to within enamel as much as possible. An impression was made with silicone elastomeric materials (Exafine Putty and Injection, GC Corp., Tokyo, Japan) using a stock tray. A working cast was prepared with die and lab stones, and mounted on an articulator with an opposing cast. The wax pattern of the FPD was fabricated, invested with a cristobalite material, and a metal framework consisting of four retainers and three pontics was cast from type IV gold alloy (Casting Gold type IV M.C., GC Corp.; Fig. 3). The facial surface of the pontics was veneered with a dual-polymerized indirect composite system (Alloy Primer, Cesead II Opaque Primer, Cesead II Opaque composite, and Estenia composite, Kuraray Medical Inc., Tokyo, Japan). The veneering technique used in this case has been reported previously (Fig. 4).¹⁷

The FPD was tried-in, and the inner surface of the retainers was air-abraded with alumina (Hi-Aluminas, Shofu Inc., Kyoto, Japan) using an air-borne particle abrader (Micro Blaster MB102, Comco Inc., Burbank, CA, USA), and conditioned with a single liquid primer (Metaltite, Tokuyama Dental Corp., Tokyo, Japan). The abutment enamel surface was etched with 40% phosphoric acid (K-Etchant, Kuraray Medical Inc.), washed with water, and air-dried. The FPD was then seated with a tri-*n*-butylborane (TBB) initiated adhesive resin (Super-Bond C&B Opaque Ivory, Sun Medical Co., Ltd., Moriyama, Japan) using a brush-dip technique (Figs. 5 and 6). The patient entered a maintenance program and the FPD was examined regularly.

Repair and re-seating of the FPD

Five years and two months after seating the FPD, the patient felt mobility of the anterior teeth (Fig. 7). Examination revealed crevices between the two left retainers and abutments. Detachment appeared to be caused by movement of abutments in a mesio-labial direction. The veneered composite was also fractured at the edge of the incisor pontic.

The FPD was dislodged with a crown remover combined with an ultrasonic instrument. Examination revealed no recurrent dental caries in all abutments. However, deposition of calculus was apparent at the root surfaces and periodontitis of the abutments appeared to be taking a turn for the worse. Figs. 8 and 9 show combined cohesive-adhesive failure of the adhesive resin between the premolar abutment and the retainer, whereas majority of the adhesive resin remained on the abutment surface rather than on the retainer (Fig. 10).

Two left retainers were cut with a rotary diamond instrument because they could not be seated in their original position due to inclination of the abutments. The fractured veneer was repaired extraorally with a hybrid composite (Epicord, Kuraray Medical Inc.), and the modified five-unit FPD was seated again with the combination of the Metaltite primer and the Super-Bond Opaque resin (Figs. 11 and 12). The resin material remaining on the abutment surface was removed before bonding the FPD, and reduction of enamel structure could be restricted to a minimal level. Six months after re-seating, the FPD is still functioning satisfactorily.

Discussion

One of the advantages of resin-bonded FPDs is minimal reduction of abutment teeth. During preparation of abutments, anesthesia is usually unnecessary. However, the technique of bonding the retainer to minimally reduced enamel structure has several disadvantages compared with the full-coverage restorative technique. One of these is higher probability of detachment of the retainer from the abutment surface. This detachment is more probable in a high-mobility dentition. Abutments affected by periodontitis are frequently located at the mandibular anterior area. On the other hand, risk of dental caries is somewhat low in this area. Although resin-based adhesives are considerably resistant against tensile stress, the resistance to bending, shearing, and peeling forces is not particularly high. Resin-bonded FPDs and splints applied to the anterior areas, therefore, tend to detach due to occlusion or inclination of the abutments. Clinicians should be aware of the limitation in longevity of resin-bonded FPDs especially when attached to mobile abutments.

Movement of abutments in the current case was remarkable compared with other patients. Dental caries, fortunately, was not detected at the abutment surfaces. In addition, the incisor pontic was considerably narrow. Two left retainers of the FPD were therefore cut, and the FPD was re-seated after repair of the fractured veneer as a cantilevered FPD. If necessary, the remaining abutments can be fixed using the Super-Bond adhesive with or without using proximal pin retainers.

Even after detachment of the original FPD, the outline form of the left abutments remained intact. This is the most outstanding advantage in application of resin-bonded FPDs. Continuous efforts to improve bond durability of such techniques are mostly required. Also, careful selection of indication and adhesive technique are important factors for the success of the resin-bonded FPDs.

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