Ten-year clinical performance of a composite repair restoration bonded with a tri-*n*-butylborane initiated adhesive resin: a case report

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This article describes the clinical course of a composite restoration applied to secondary dental caries adjacent to a single restoration. After cavity preparation, the dentin surface was treated with citric acid and ferric chloride aqueous solution. A thione primer (V-Primer) and a silane primer (Porcelain Liner M) were separately applied to the metal and porcelain surfaces. An adhesive opaque resin (Super-Bond Opaque Ivory) and two layers of composite resins (Metafil Flo Opaque and Metafil C) were placed into the cavity. After an observation period of 11 years and 1 month, the restoration is functioning. The materials and bonding technique reported here are applicable as an option for a single-visit repair treatment. (Asian Pac J Dent 2013; 13: 37-39.) Key Words: adhesive, alloy, composite, porcelain, primer, repair

Introduction

Single-visit repair treatment is sometimes requested from patients in particular as an urgent restoration of fractured anterior dentition. Composite restorative materials are frequently used for repair as well as restorations. This is due to the fact that bonding to dentin of light-polymerized composite materials has improved considerably through the development of self-etching adhesives containing acidic monomers. Also, a number of metal and porcelain priming systems have been introduced for use with adhesives and composite restorative materials. This report describes the clinical course of a direct composite repair restoration bonded with a self-polymerizing adhesive system.

Clinical Report

A 61-year-old female patient presented with a chief complaint of esthetic disturbance associated with gingival recession and discoloration of her left maxillary central incisor (Fig. 1). The incisor had undergone treatment with a porcelain-fused-to-metal (PFM) restoration, which was functioning for more than 5 years. Examination revealed that the abutment tooth was not vital, and fracture of the root was not detected. The cervical area, however, had been considerably discolored. Two treatment options were proposed: 1) dislodgment and replacement of the restoration; and 2) direct restoration with an adhesive system. The patient chose the latter option. The restorative procedure was then explained in detail and consent obtained from the patient. A summary of the restorative procedure for this case was previously reported.¹

A direct restorative treatment with a microfilled composite resin was planned. Although cavity preparation could be completed with diamond rotary cutting instruments with water coolant, the incisal wall of the cavity was extended to the cervical porcelain of the PFM restoration, whereas pulpal wall of the cavity consisted of metallic structure, i.e., an axial wall of the dowel core. The remaining surfaces to be restored were dentin (Fig. 2).

The dentin surface was treated with 10% citric acid and 3% ferric chloride aqueous solution (Green

Conditioner, Sun Medical Co., Ltd., Moriyama, Japan) for 5 s, washed with water, and air-dried (Fig. 3). A single liquid thione primer (V-Primer, Sun Medical Co., Ltd.) was applied to the metal surface, and a two-liquid silane primer (Porcelain Liner M, Sun Medical Co., Ltd.) was applied to the porcelain surface (Fig. 4). These two primers were applied separately with an applicator before air-drying. A self-curable adhesive opaque resin (Super-Bond Opaque Ivory, Sun Medical Co., Ltd.) was applied to the cavity floor to hide the metallic color (Fig. 5). The opaque resin is capable of bonding intraorally all of the shown adherends and composite resin. Before setting the adhesive resin, layers of composite resins, Metafil Flo Opaque and Metafil C (Sun Medical Co., Ltd.) were filled into the cavity and exposed to light for 20 s and 60 s, respectively (Figs. 6 and 7). The restored surface was ground and polished with a series of diamond and silicone rotary instruments. The patient then entered a maintenance program (Fig. 8). Figure 9 shows a photograph taken 11 years and 1 month after restorative treatment. Although brownish discoloration of interface between the porcelain and the composite resin can be seen, both the PFM and composite restorations are functioning.



Fig. 1. Pre-operative view



Fig. 4. Application of V-Primer and Porcelain Liner M



Fig. 7. Metafil C as a restorative material



Fig. 2. Cavity preparation



Fig. 5. Super-Bond Opaque Ivory as an adhesive



Fig. 8. Repair restoration



Fig. 3. Etching dentin with Green Conditioner



Fig. 6. Metafil Flo Opaque



Fig. 9. 11 years and 1 month after repair

Discussion

The Super-Bond Opaque Ivory resin consists of three components; monomer liquid, powder, and initiator. The monomer liquid contains 5% 4-methacryloyloxyethyl trimellitate anhydride (4-META) in methyl methacrylate (MMA). The powder is a mixture of pulverized poly-MMA and surface-coated titanium dioxide.

The initiator is a partially oxidized tri-*n*-butylborane (TBB). The material therefore is abbreviated as 4-META/MMA-TBB opaque resin. Combined application of the 4-META/MMA-TBB opaque resin and light-cured composite resin was originally introduced as a bonding technique for metal frameworks of cast restorations and composite facing materials.^{2,3} According to their report, the 4-META/MMA-TBB opaque resin and composite facing materials can be bonded if a light curable opaque resin or a tooth-colored composite resin was placed before setting the TBB initiated resin. The technique is also applicable for intraoral bonding between dentin, alloys, porcelain, and composite resins. The current case used 4-META/MMA-TBB opaque resin as an adhesive for intraoral bonding of dentin, noble metal alloy, porcelain, and a light-polymerized composite restorative material.

Studies have shown the possibility of inducing reciprocal effect of several primers on bonding to dentin of TBB initiated resin. Kajihara et al.⁴ reported double-priming on bonding to dentin of TBB initiated resin. Their results showed that bonding to dentin of TBB initiated resin was not negatively affected by double-priming as long as the Green Conditioner was employed. However, bond strength to Ag-Pd-Cu-Au alloy was considerably reduced when the Green Conditioner was applied to the alloy before application of TBB initiated resin. Care must be taken when the adherend surface consists of both dentin and Ag-Pd-Cu-Au alloy.

Brownish discoloration is sometimes detected along the bonded interface of TBB initiated resin. Superficial discoloration can be eliminated for most of cases by polishing the surface with rotary instruments. The remaining issues to be solved are; 1) enhancement of bonding between porcelain and TBB initiated resin,⁵ and improvement in wear resistance of the TBB initiated resin.^{6,7}

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