

Clinical application of a tri-*n*-butylborane initiated adhesive resin filled with pre-polymerized composite particles

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A tri-*n*-butylborane (TBB) initiated adhesive resin with pre-polymerized filler particles (Bondfill SB) has been released. This article describes bonding technique and short-time clinical performance of the adhesive. The materials and procedure reported here are applicable as an option of the restorative treatments for the patients incompatible to currently available materials. (*Asian Pac J Dent* 2011; 11: 61-65.)

Key Words: adhesive, attrition, tri-*n*-butylborane, wear, wedge-shaped defect

Introduction

Attrition, gingival recession, wear, and wedge-shaped defect progress, especially for aged patients, due to clenching, grinding, mastication, tapping, tooth brushing, and other factors. It is beneficial for both tooth structure and dental material if their wear resistance were equivalent, in particular at the occlusal contact areas. An adhesive resin initiated with tri-*n*-butylborane (TBB) derivative, in combination with varying primers, is being used for bonding between tooth structure and restorative materials. One of the problems associated with the TBB-initiated adhesive resin has been insufficient wear resistance.^{1,2}

A modified TBB resin that contains pre-polymerized filler particles (Bondfill SB, Sun Medical Co, Ltd, Moriyama, Japan) was released. The manufacturer claims that the material is applicable as a filling, luting, or sealing agent. Property test demonstrated that the Bondfill SB material showed different wear characteristics as compared with the conventional acrylic resins.³ This article presents adhesive techniques of the Bondfill SB resin applied mainly for bonding dentin.

Clinical Report

Table 1 summarizes the difference between the Super-Bond C&B and Bondfill SB resins.

Table 1. Tri-*n*-butylborane (TBB) initiated adhesive resins

Material / Trade name	Manufacturer	Composition
Super-Bond C&B	Sun Medical Co., Ltd.	
Monomer		MMA, 4-META
Polymer		PolyMMA, Pigment
Catalyst		TBB, TBB-O
Bondfill SB	Sun Medical Co., Ltd.	
Teeth Primer		4-META, Acetone, Water, Reducing agent
Monomer		MMA, 4-META, Polyfunctional methacrylate
Powder		PolyMMA, TMPT pre-polymerized filler, Pigment
Catalyst V		TBB, TBB-O, Hydrocarbon

MMA, methyl methacrylate; 4-META, 4-methacryloyloxyethyl trimellitate anhydride; TBB, tri-*n*-butylborane; TBB-O, partially oxidized tri-*n*-butylborane; TMPT, trimethylolpropane trimethacrylate

Cervical dental caries

The patient felt cold-water pain after detachment of composite restoration of the maxillary premolar (Fig. 1).

The tooth surface was minimally reduced with a diamond rotary cutting instrument. The Teeth Primer was applied to the non-retentive reduced surface and air-dried. The Bondfill SB resin (Medium Powder) was filled into the cavity with a brush-dip technique (Fig. 2). The excess material was removed and the surface was polished with silicone rotary instruments (Fig. 3). After the restoration, the cold-water pain was disappeared immediately.



Fig. 1. Premolar dental caries



Fig. 2. Filling the Bondfill SB



Fig. 3. Post-operative view

Incisal attrition

An aged patient was seen with a chief complaint of uncomfortableness of anterior dentition derived from tooth wear. Examination revealed severe attrition of mandibular incisors with steps along the dentino-enamel junction (Fig. 4). The tooth surface was slightly reduced with a diamond rotary instrument. The Teeth Primer was applied to the incisal areas and air-dried (Fig. 5). The Bondfill SB resin (Light Powder) was filled into the cavity with a brush (Fig. 6). The surface was polished with silicone rotary instruments (Fig. 7). Smoothness of the incisal area was recovered after the restoration.



Fig. 4. Worn incisors



Fig. 5. Application of the Teeth Primer



Fig. 6. Filling the Bondfill SB resin



Fig. 7. Restored surfaces

Occlusal attrition

The patient preferred carbonated beverages, and occlusal planes of mandibular molars were attrited considerably (Fig. 8). The tooth surface was reduced and the Teeth Primer was applied. The Bondfill SB resin (Light Powder) was then filled into the defects with a brush (Fig. 9).



Fig. 8. Attrited mandibular molar



Fig. 9. Bondfill SB restoration

Secondary dental caries

Secondary dental caries was detected along the interface between the centric holding cusp and the resin-bonded retainer (Fig. 10). The recurrently decayed tooth structure was removed, the Teeth Primer was applied, and the Bondfill SB resin (Light Powder) was filled into the cavity (Fig. 11).



Fig. 10. Secondary dental caries under the retainer



Fig. 11. Restoration with the Bondfill SB

Repair of fractured composite veneer

A patient with fractured composite resin veneered restoration was seen (Fig. 12). The patient requested one-visit repair. The fractured area was reduced with a diamond rotary cutting instrument, and the V-Primer (Sun Medical Co., Ltd.) was applied to the metal surface to be repaired. The V-Primer contains 6-(4-vinylbenzyl-*n*-propyl) amino-1,3,5-triazine-2,4-dithione (VTD) and effective only for noble metal alloys.⁴ The Bondfill SB resin with Medium Powder was applied to the incisal coping surface and the metallic color was masked (Fig. 13). The Bondfill SB resin with Light Powder was layered on the primarily placed material (Fig. 14). The repair was completed within a short period.



Fig. 12. Fractured veneer

Fig. 13. Repairing with the Bondfill

Fig. 14. Completed repair

Pit and fissure sealants

The TBB resins were developed originally as an adhesive for orthodontic brackets as well as a pit and fissure sealant (Fig. 15). A phosphoric acid etchant (High-viscosity, Red) was applied (Fig. 16), rinsed with water, and air-dried. The Bondfill SB resin was filled into the pits and fissures (Figs. 17 and 18).



Fig. 15. Pre-operative view



Fig. 16. Etching with phosphoric acid (Red)



Fig. 17. Application of the Bondfill SB



Fig. 18. Sealed pits and fissures



Fig. 19. Inlay cavity

Figs. 20, 21. Application of adhesive after priming

Fig. 22. Seated restoration

Seating detached restorations with insufficient retentive structure

Detachment of inlay restoration is sometimes experienced in relation with shallow cavities (Fig. 19). Prior to re-seating the restoration, the metal surface was air-abraded with alumina, followed by priming with the V-Primer, when the material was a noble metal alloy (Fig. 20). The restoration was seated with the Bondfill SB resin (Figs. 21 and 22). Probability of detachment will be reduced by application of the bonding system shown in this case.

Discussion

This article presented application of the Bondfill SB resin to occlusal contact areas. Clinical experiences have shown that cusps and incisal edges tend to suffer from fracture when these areas consist of rigid substances including hydroxyapatite. The Bondfill SB material is not so much rigid as conventional composite resin and adhesive to dentin. Such material shows characteristics of gradual wear and continuous surface smoothness rather than sudden fracture in an oral environment. In addition, inorganic component of the TMPT pre-polymerized filler is one of the submicron fillers. Application of the TMPT filler therefore contributes to surface smoothness of the polymerized material. Clinicians, however, should aware that the Bondfill SB resin must cautiously be applied to patients as a successional material of the Super-Bond C&B resin, because long-term clinical results have not been reported in literature. The clinical cases presented in this article will appear secondarily in another publication with Japanese language.⁵

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