Repair Bond Strength of Aged Resin Composite Using Sliane-containing Universal Adhesive System

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Abstract

To evaluate the effect of a silane-containing universal adhesive system to repair bond strength of aged resin composite, clear self-cured epoxy resin was poured into the prepared PVC and Flitek™ Z350 XT shade A1 was packed into 45 PVC tubes. The 45 specimens were thermocycled for 5,000 cycles between 5 and 55 °C. The specimens were ground, then, treated with Scotchbond™ etchant and divided into 3 groups. Group 1 was treated with Clearfil SE Bond (n=15). Group 2 was treated with Clearfil Ceramic Primer and Clearfil SE Bond (n=15). Group 3 was treated with Single Bond™ Universal Adhesive (n=15). Flitek™ Z350 XT shade A4 was packed in the split stainless steel mold to bond with the prepared specimens. All specimens were subjected to shear bond strength testing and record the result. The mean shear bond strength values of group 1, group 2, and group 3 were 10.21, 15.86, and 14.14 MPa, respectively. Group 2 and 3 showed a statistically significant higher shear bond strength than group 1 (Shapiro-Wilk test, One-way ANOVA and Turkey's test). However, there was no significant difference in shear bond strength between group 2 and 3. Silanization can improve the repair bond strength of aged resin composite. The application of a silane-containing universal adhesive was as effective as the use of silane and adhesive combination tested. The use of this material can be applied for nanofilled composite repair.

Keywords: *aged resin composite, repair bond strength, repair resin composite, shear bond strength, universal adhesive system*

1. Introduction

The common failures of resin composite restoration are poor marginal integrity, fracture, discoloration, and secondary caries. The treatment of choices would be replacement or repair. Resin composite replacement procedure is to remove all of the restorations and surrounding sound tooth structure. Even though the composite replacement is an invasive treatment, there is nothing to concern about the bond of the aged and new restoration. The preparation of resin composite restoration is less invasive treatment, however, there are still some questions about bonding between aged and new restoration (Blum et al., 2014).

The mechanism of bonding of composite repair is mechanical and chemical adhesion. The mechanical adhesion is the interlocking between adhesive and irregularities on the surface of substrates. To create a mechanical interlocking, roughening a surface of resin composite with diamond bur, carbide bur, silicon carbide paper or air abrasion with 50 μ aluminum oxide particles is recommended. The chemical adhesion is bonding between resin matrix and hydroxyl groups on silica filler surface by using silane coupling agents (Fornazari et al., 2017; Heymann et al., 2014). The methacrylate group of silane forms covalent bonds with repaired resin composite when it is polymerized. Silane also enhances the wetting ability of the adhesive over the irregularities created by surface roughening (Hemadri et al., 2014).

Reparation of resin composite often presents a different challenge; while there is no oxygen-inhibited layer if any, few unreacted double bonds remain in the aged composites for bonding to the new composite. Thus, the potential for chemical bonding between aged and new composite layers decreases over time. Improving the bond strength between new and aged composite requires to increase surface roughness to promote mechanical interlocking and coating with a silane coupling agent to enhance the surface wetting ability and produce chemical bonding (Nihei, 2016; Blum, 2014).

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