Chiang Mai Dental Journal

Original Article

Shear Bond Strength of Bulk-fill Resin Composite after Bur and Air Abrasion Surface Treatments

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Received: June 19, 2020 • Revised: August 17, 2020 • Accepted: February 4, 2021

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Abstract

Objectives: To investigate the shear bond strength of aged bulk-fill resin composite after being repaired using different surface treatments and types of resin composite.

Methods: Sixty cylindrical specimens of bulk-fill resin composite (X-tra fill®) 6 mm in diameter and 4 mm thick were prepared using an acrylic mold. They were aged using thermocycling at 5o and 55^{O}C for 5,000 cycles then mounted with self-cured resin acrylic in PVC tubes. The specimens were divided into 3 groups using surface treatments, including (a) abraded with a diamond bur, (b) air-abraded (sandblasted), and (c) no surface treatment. The specimens were then divided into 2 subgroups according to the resin composites used (viz., Filtek Z350XT®or X-tra fill®). All of the samples were divided into 6 groups (n=10): Group 1 (Bur + Filtek Z350XT®); Group 2 (Bur + X-tra fill®); Group 3 (Sandblast + Filtek Z350XT®); Group 4 (Sandblast + X-tra fill®); Group 5 (No surface treatment + Filtek Z350XT®); and, Group 6 (No surface treatment + X-tra fill®). The specimens were then tested for shear bond strength using a universal testing machine (0.5 mm/min). Fractured samples were examined under a stereomicroscope to determine the mode of failure. The results were analyzed using Friedman's Two-way Analysis of Variance by rank with a significance level of 0.05.

Results: The respective median sorted from highest to lowest values for Group 4, 2, 3, 1, 5, and 6 was 25.8, 25.5, 22.1, 21.8, 14.0, and 13.2 MPa. Differences between values were statistically significant ($p<0.001$). All surface treatments demonstrated significantly greater shear bond strength than not having any surface treatment. Groups 1, 2, 3, and 4 were statistically significant different from group 5 and 6 ($p<0.001$), but there was no respective statistically significant difference between Groups 1 and 3 ($p>0.99$), and Groups 2 and 4 ($p=0.94$). Repairing with X-tra fill® had higher shear bond strength than Filtek Z350XT®. A statistically significant difference was found between Groups 1 and 2 ($p=0.001$), Groups 3 and 4 ($p=0.019$), but not between Groups 5 and 6 ($p=0.762$). All specimens in Groups 2 and 4 had cohesive failure, while Groups 5 and 6 demonstrated adhesive failure, and Groups 1 and 3 exhibited both types of failure.

Conclusions: Shear bond strength of aged bulk-fill resin composite after being repaired using bur and air abrasionsurface treatments were no different, but greater than no surface treatment.

Keywords: bulk-fill resin composite, resin composite repair, shear bond strength, surface treatment, thermocycling