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Effect of Surface Treatment on Bond Strength of Fiber-Reinforced CAD/CAM Blocks

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Objectives The aim of the study was to compare the shear-bond strength (SBS) of conventional CAD/CAM composite (Cerasmart 270) and experimental short fiber-reinforced CAD/CAM composite (SFRC) to luting cement with different surface treatments before and after aging.

Methods Discs (14 mm × 18 mm × 3 mm) obtained from Cerasmart 270 and SFRC blocks were mounted in acrylic resin (Palapress Vario; Heraeus Kulzer,) and polished flat using an automatic grinding machine (Rotopol-1; Struers) with 180 and 320 grit silicon carbide papers to create a standard surface for bonding. Two surface treatment protocols were applied to surfaces of Cerasmart 270 and SFRC specimens: 1) sandblasting (SB) (n=40) and 2) sandblasting followed by a 60 sec application of hydrofluoric acid (HF) (n=40). Subsequently, luting cement (G-CEM One; GC, Tokyo, Japan) was placed on the treated surfaces. Two specimens from each material with different surface treatments were evaluated with SEM analysis. Half of the specimens (n=20) were subjected to the SBS test after 48 hours of storage in water at 37°C, while the other half (n=20) underwent the SBS test after 16 hours of aging by boiling. SBS test was performed using a universal testing machine (Lloyd Universal Testing Machine LRx; Lloyd Instruments) at a crosshead speed of 1.0 mm/min until failure occurred. The failure modes of the specimens were analyzed with visual inspection. Data were analyzed using ANOVA.

Results In the SB treated group, higher SBS values were obtained in the SFRC blocks compared the Cerasmart 270; aging did not adversely affect the bond strength for both materials. When 60 sec HF acid was applied after SB, there was no significant difference between the materials (p<0.05), but SBS values decreased after aging.

Conclusions Sandblasting alone is sufficient for bonding SFRC to luting cement, while the addition of HF acid after sandblasting appears necessary for achieving optimal bonding with Cerasmart 270.