Abstract

PURPOSE: To compare microtensile bond strength and characterize the bond of nano-structured alumina-coated vs tribochemically silica-treated zirconia specimens.

MATERIALS AND METHODS: Eight zirconia blocks were assigned to two groups: nano-structured alumina coating (AlN) and tribochemical silica treatment (CoJet) followed by RelyX Ceramic Primer (COJ). For each group, two identically pre-treated zirconia blocks were bonded with RelyX Unicem 2 Cement and cut into 30 stick-shaped specimens (1 x 1 x 9 mm3). A total of 120 specimens were stored in distilled water at 37°C for 24 h and then assigned to three groups (n = 20/test group): short-term test, thermocycling 5000 cycles, and thermocycling 10,000 cycles. The specimens were tested in tensile mode. The bond strength results were analyzed using two-way ANOVA, followed by one-way ANOVA and Tukey’s HSD (α = 0.05). Failure mode and surfaces were analyzed with optical microscopy and SEM. FTIR and EDS were used for chemical analyses on primer-, mechanically and/or chemically pre-treated surfaces.

RESULTS: The mean bond strengths of AlN and COJ groups were not statistically significantly different in all aging conditions (p > 0.05). Thermocycling significantly decreased the bond strength of both groups (p < 0.01). The AlN groups exhibited predominantly either adhesive or mixed failure, whereas the specimens in the COJ groups mainly presented either mixed or cohesive failure in
composite cement. Silane chemically reacted with mechanically pre-treated COJ surface via the absorption of Si-O group.

CONCLUSION: The composite-zirconia bond strength after application of a nano-structured alumina coating was comparable to that after tribochemical silica treatment.

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