

Color changes and shear bond strength to simulated caries lesions treated with a novel solution of 20% silver nanoclusters in polymethacrylic acid

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Resumen

The aims of the study were: (1) To compare the staining effect on demineralized dentin simulating caries between silver nanoclusters (AgNCIs) synthesized using polymethacrylic acid (PMAA) and silver diammine fluoride (SDF), and (2) to measure the shear bond strength (SBS) of a glass ionomer cement (GIC) to simulated caries lesions with and without the application of AgNCIs/PMAA or SDF. Dentine blocks 4 mm thick from twenty-four non-carious third molars were sectioned and coated with nail varnish (Revlon, New York, USA). Simulated caries lesions on occlusal dentin surfaces were created (66 h in 0.05 M acetate buffer 2.2 mM calcium/phosphate pH 5.0). Specimens were divided into groups and

treated with (n = 8): (A) 20% AgNCl_s/PMAA; (B) SDF 38% (Fagamin, Tedequim, Córdoba, Argentina); or (C) without treatment. AgNCl_s/PMAA or SDF were applied on the exposed surfaces with a microbrush for 10 s. Samples were incubated for 24 h at 37 °C at 100% relative humidity. Surface color was measured according to the CIE-L*a*b* system before and after demineralization (R0 and R1), 24 h and one week after treatment (R2 and R3), using a spectrophotometer (CM-600D Konica Minolta Sesing Inc., Japan). Groups A and B received an extra application of AgNCl_s/PMAA or SDF before a conventional GIC (Fuji IX-Gold Label, GC Corp, Tokyo, Japan) was bonded using a mold, 4 mm diameter × 3 mm high. For SBS, a Universal Testing Machine (Digimess RS-8000-5, China)—crosshead speed of 1 mm/min—was used. Statistical analysis was performed using ANOVA, Student-t and Scheffe-test at a significance of p < 0.05. Group A presented a stable color p = 0.24 between R1-R2 and R1-R3 in contrast to significant color changes in Group B (p = 0.02). SBS was higher (p < 0.01) in Group A (10.4 ± 2.7 MPa) compared to Groups B (3.3 ± 1.3 MPa) and C (4.0 ± 0.4 MPa), where no differences between the latter groups were observed (p = 0.77). Results of this preliminary study demonstrated that 20% AgNCl_s/PMAA did not stain simulated carious dentin and improved SBS of the GIC. The relevance of this study relies on the development of a therapeutic system to potentially arrest caries lesions without staining.

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