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Impact of Immediate Versus Delayed Dentin Sealing on Bonding Effectiveness

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Objectives To evaluate the effect of immediate (IDS) versus delayed (DDS) dentin sealing on the micro-tensile bond strength (μ TBS) of CAD-CAM composite adhesively luted onto dentin.

Methods Upon sandblasting (29 μ m alumina, Velopex), silanization (Clearfil Ceramic Primer Plus, Kuraray Noritake) and non-cured adhesive application ('C-SE2'; Clearfil SE Bond 2, Kuraray Noritake), CAD-CAM composite slabs (Katana Avencia, Kuraray Noritake) were adhesively luted (AL) onto bur-cut dentin using composite (Clearfil AP-X, Kuraray Noritake) following 8 protocols: ¹'DDS_LCadh': C-SE2 light-cured (LC) on dentin prior to AL; ²'DDS_prov': temporary restoration, 2-week saliva storage, C-SE2 LC, AL; ³'DDS_noLCadh': C-SE2 (non-LC), AL; ⁴'Pulpless_noLCadh': = DDS_LCadh except having filled the pulp chamber with composite (non-vital tooth); ⁵'IDS_non_contamin': C-SE2 LC, flowable composite (Clearfil Majesty Flow High, Kuraray Noritake), sandblasting, phosphoric-acid etching, C-SE2 (non-LC), AL; ⁶'IDS_water': = IDS_non_contamin but 2-week water storage before AL; ⁷'IDS_water': = IDS_non_contamin but 2-week saliva storage; ⁸'IDS_provisional': = IDS_non_contamin but IDS covered with temporary restoration, 2-week saliva storage. After one-week immersion in distilled water, half of the specimens were cut for μ TBS testing and the other half submitted to 1,200,000 chewing cycles, subsequently cut into μ -specimens and submitted to 10,000 thermal cycles before being tested. Light-microscopy fracture analysis ('adhesive interfacial failure', 'cohesive failure in dentin', 'cohesive failure in composite', 'mixed failure') of all specimens was performed, followed by SEM fracture analysis of selected specimens. Data were analyzed using 2-way ANOVA and Tukey ($\alpha=0.05$).

Results No μ TBS was recorded for DDS_noLCadh (all pre-testing failures or PTF). Significantly lower μ TBS was recorded for Pulpless_noLCadh. The μ TBS of aged IDS_saliva was significantly lower than that of the protocols with the highest μ TBS recorded. No significant decrease in μ TBS was recorded upon aging.

Conclusions Light-curing the adhesive separately before bonding improved μ TBS. IDS did not improve bonding effectiveness as compared to DDS.