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Shear Bond Strength of Cement to Zirconia

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Résumé / Abstract

This study investigated the shear bond strength (SBS) of various cements to zirconia ceramic. CoCr-cylinders were bonded to zirconia plates (20 mm × 10 mm × 2 mm; n = 8 per group) using four self-adhesive resin cements (one capsule, three hand-mixed) and four resin cements, partly in combination with a tribochemical/silane treatment. All cements were auto-polymerizing. The bonding areas were sandblasted using 110 µm Al₂O₃. The shear bond strength was determined after 24 h, 30 days, 90 days of water storage (37°C) and after 12000 thermal cycles. Statistical analysis was performed using one-way analysis of variance (ANOVA) and Bonferroni post hoc test ($\alpha = 0.05$). After 24 h and after thermal cycling (TC) the lowest value of shear bond strength was found for the control Variolink without bonding pre-treatment (9.5 MPa/3.1 MPa) and the highest results were determined for Calibra with bonding pre-treatment (37.3 MPa/31.9 MPa). After 30 days and 90 days of storage in water the highest SBS values were found for RelyX (33.3 MPa/28.6 MPa), and again lowest values were determined for Variolink (8.8 MPa/9.1 MPa). After 90 days storage all samples of Maxcem failed. The groupwise comparison revealed significantly different SBS results between 90 days storage and the initial results after 24 h ($p = 0.003$). No significant differences were found between the other storage conditions ($p > 0.057$). The systems without bonding pre-treatment provided significantly lower SBS in comparison to the self-adhesive systems and the systems with bonding pre-treatment ($p = 0.000$). Within the limitations of this study, three of four self-adhesive bonding systems provided bond strengths to zirconia, comparable to systems with additional bonding pre-treatment. The durability of the bonding resin and zirconia can only be judged after long-term water storage.

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