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Heat treatment during setting on properties of resin-based provisional-restorative materials



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Purpose: To study the effect of heat treatment during setting on the physical properties of four resin-based provisional restorative materials.

Methods and materials: Four commercial restorative resin materials were employed, namely Duralay (polymethyl methacrylate), Trim II (polyethyl methacrylate), Luxatemp (bis-acrylic composite) and Protemp 4 (bis-acrylic composite). Specimens were prepared at 23 °C, 37 °C or 60 °C in a water bath for evaluation of flexural strength, surface profile, color stability and marginal discrepancy. Flexural strength was determined by 3-point-bending test on each specimen after thermo-cycling (3000 cycles, between 5-55 °C), and its fractured surface was examined under scanning electron microscopy. Surface profile of the specimens was studied using atomic force microscopy. Color stability (ΔE^*) was evaluated by comparing the color of the specimens before and after placed in coffee for 14 days. Standardized crowns were prepared for assessment of marginal discrepancy using a travelling microscope.

Results: Flexural strength of Trim II and Protemp 4 at 60 °C (Trim II: 51.52 ± 5.59 MPa, Protemp 4: 115.41 ± 12.76 MPa) were higher than those at 37 °C (Trim II: 43.61 ± 6.21 MPa, Protemp 4: 89.38 ± 8.59 MPa) and 23 °C (Trim II: 41.79 ± 5.37 MPa, Protemp 4: 87.50 ± 10.29 MPa) ($p < 0.05$). Flexural strength of Duralay and Luxatemp were not significantly different at different curing temperature ($p > 0.05$). Slight difference of surface morphology could be seen between different curing temperatures of all types of materials. Luxatemp and Protemp 4 have lower ΔE^* compared with other materials, in all the three curing temperatures. Marginal discrepancy of Trim II, Luxatemp and Protemp 4 were higher at 60 °C than those at 23 °C and 37 °C.

Conclusion: Increase in curing temperature enhances flexural strength of certain resin-based acrylic provisional veneers; however, there is also an increase in the marginal discrepancy. Different curing temperature slightly altered the surface morphology and color stability of material, while different materials have obvious different properties in terms of surface morphology and color stability.

Keywords: Resin; Provisional; Restorative

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Polymerization shrinkage-stress kinetics of resin-composites

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Purpose: To investigate the effect of monomer matrix of several dimethacrylate based resin-composites, on their shrinkage-stress kinetics.

Methods and materials: Eighteen commercially available resin-composites with varying resin matrices were investigated including nanohybrid, microhybrid and bulk fill resin-composites. The investigated materials were a range of flowable and non-flowable resin-composites. Three specimens ($n=3$) were made per material and light-cured with an LED unit (1200 mW/cm^2) for 20 s. The Bioman shrinkage-stress instrument was used to measure shrinkage-stress. The shrinkage-stress kinetics at 23 °C were monitored for 60 min. Maximum stress was recorded at 60 min. The shrinkage-stress rate was calculated using numerical differentiation. Data were analysed by One-way ANOVA and Dunnett test ($P = 0.05$).

Results: Shrinkage-stress values ranged from 3.94 (0.40) MPa for Tetric Evoceram (TET), to 10.49 (0.41) MPa for Beautifil flow plus (BFP). BFP showed no significant differences when compared to the other flowable materials Estelite flow quick (EFQ), Grandio SO heavy flow (GSO) and G-aenial universal flow (GUF). The lowest stress rate was recorded by Venus diamond (VD) $0.32 (0.01) \text{ MPa s}^{-1}$, whereas the highest value was recorded by G-aenial universal flow (GUF) $1.64 (0.10) \text{ MPa s}^{-1}$. GUF showed no significant difference when compared to Spectrum TPH (STPH).

Conclusion: Investigated resin-composites demonstrated a different shrinkage behaviour that was strongly related to their different monomer systems. The nature of the monomer system determines the amount of the bulk contraction that occurs during polymerization and the resultant stress. Flowable materials had the highest values of shrinkage stress. The bulk fill materials showed comparable result when compared to traditional resin-composites.

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Effect of fiberglass post-customization on the properties of adhesive interface



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Purpose: The aim of this study was to evaluate the mechanical properties (elastic modulus and Martens hardness) of resin cement and underlying dentin of the adhesive interface