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Viscoelasticity of dental polymers used for orthodontic applications

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Aim: To evaluate the viscoelastic properties of two experimental BPA-free and one BisGMA-based orthodontic resin composite adhesives for bonding fixed retainers.

Materials & Methods: A commercially available BisGMA-based (TXA: Transbond LR) and two Bisphenol A-free experimental adhesives (EXA and EXB) were included in the study. The viscoelastic behaviour of the adhesives were evaluated under static and dynamic conditions at dry and wet states and at various temperatures (21, 37, 50°C). The parameters determined were shear modulus (G), Young's modulus (E) under static testing and storage modulus (G1), loss tangent (tan δ) and dynamic viscosity (n*) under dynamic testing. Statistical analysis was performed by 2-way ANOVA and Bonferroni post-hoc tests (α=0.05).

Results: For static testing, a significant difference was found within material and storage condition variables and a significant interaction between the two independent variables ($p<0.001$ for G and E). EXA demonstrated the highest G and E values at 21°C/dry group. Dry specimens showed the highest G and E values, but with no significant difference from 21°C/wet specimens, except EXA in G. Wet storage at higher temperatures (37°C and 50°C) adversely affected all the materials to a degree ranging from 40-60% ($p<0.001$). For dynamic testing, a significant difference was also found in material and testing condition groups, with a significant interaction between the two independent variables ($p<0.001$ for G1 and n*, $p<0.01$ for tan δ). Reduction in G1, and n* values, and increase in tan δ values were encountered at increased water temperatures.

Biography

T Eliades is a Professor and Director of the Clinic of Orthodontic and Paediatric Dentistry, University of Zurich, Switzerland.

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