

Effect of Excitation Energy on Composite Bond

Strength and Properties

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Abstract

A number of available dentine adhesives and dental composites require light activation for polymerization. There are many variables which affect the light absorbing properties (e.g. bond strength) of these materials. The purpose of this study was to determine the influence of excitation energy (EE) on the dentine shear bond strength (SBS) of two lengths (2.1 mm and 3.25 mm) of light-cured (or dual-cured) dentine adhesives/dental composites. Diametral tensile (DTS) and compressive (CS) strengths of the same composites were also studied as a function of EE. Three resin composites with their respective adhesives (Marathon One/Tenure, Z100/Scotchbond Multi-Purpose and Herculite XRV/Optibond) were used. Five commercial curing lights were used to produce spectra of 100-650 mW cm⁻². The data were analysed using ANOVA and the Tukey LSD test. No significant correlation was observed at the $P > 0.05$ level between EE and SBS in the shorter specimens. The SBS of Optibond is independent of EE and composite length. The SBS data were also analysed with Weibull statistics. The characteristic strengths calculated varied between 14 and 27 MPa. For the composites tested, mean values of DTS varied between 33 and 54 MPa and CS varied between 167 and 414 MPa. The DTS and CS of Z100 were significantly greater than those of the other materials. Intensities ≥ 250 mW cm⁻² produced equivalent mechanical properties within all composite materials and equivalent bond strengths in systems which included dentine, adhesive and composite resin.