Research & Table Clinic Day 2020 Structured Abstract

TITLE: Wavelength-Dependent Strength of Photo-activated Resin Veneer Cements

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TITLE:

Wavelength-Dependent Strength of Photo-activated Resin Veneer Cements

OBJECTIVES:

To evaluate the effects of application of violet or blue light on strength of light-curable-only resin cements.

METHODS:

Discs (6.5 mm dia, 0.6 mm thick) of commercially available, light-curable-only resin cements for veneer bonding were exposed (20s) to curing lights providing extremes between wavelength outputs in order to identify responses of different photoinitiators that might be in each product: blue light only [SmartLite Focus, Dentsply (850 mW/cm^2, peak output at 476 nm] and violet light only [Ultralume 5 (with blue LED inactivated), Ultradent Products (97 mW/cm^2, peak output at 390 nm). Resin veneer cement products included: BISCO (eCement, Choice 2); COSMEDENT (Insure Resin Cement); 3M (RelyX Veneer Cement); KERR (NX3 Permanent Dental Cement Light Cure); ULTRADENT (Permashade LC); IVOCLAR/VIVADENT (Variolink Esthetic LC); and DENTSPLY/SIRONA (Calibra Veneer). Light-cured specimens were dark-stored at 37°C/24h, and then tested for biaxial flexural strength (MPa) in a universal testing machine. Specimens were made/tested in a randomized order. (n=5 per condition).

RESULTS:

2-way ANOVA (pre-set alpha 0.05) indicated both factors, and their interaction, significantly affected strength ($p<0.001$). All materials demonstrated effectiveness of blue light in curing, but strength values varied greatly among products. Not all products demonstrated effective polymerization from violet light exposure. Among those that did, there was a great variation in strength values. One product was equally strong when exposed to either light (COSMEDENT), and one product was stronger when exposed to violet than to blue (IVOCLAR/VIVADENT).

CONCLUSIONS:

The extent of polymerization (assessed by strength) arising from exposure of light-curable resin cements to different wavelengths produces a wide variation among products. Strength was highly dependent on wavelength of exposure, indicating that application of the proper spectral light output may be highly significant to optimal veneer resin cementation. These findings may have great clinical significance.

LEARNING OBJECTIVES:

1. State issues clinicians face when using a light with known wavelength output on photocuring a dental cement requiring unknown exposure to specific wavelengths
2. Recognize differences in the spectral emission from dental curing lights and their potential interaction with photoinitiators in resin cements.
3. Application of proper wavelengths of a curing light might optimize resin cement curing, potentially affecting the long-term durability of a cemented restoration.