Research & Table Clinic Day 2020 Structured Abstract

TITLE: Testing for Photoinitiator Type in Light-cured Orthodontic Bracket Adhesives

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OBJECTIVES:

To measure/compare flexural strength of light-cured orthodontic resins when exposed to different wavelength curing light sources.

METHODS: Discs (6.5 x 0.5mm) of 14 different commercially available, photo-cured orthodontic brackets from 7 different manufacturers were made in a silicone mold: 3M/UNITEK (Transbond Supreme, TB Plus, TB LR, TBXT); American Orthodontics (Brace); GC (Connect); Reliance (Go To, Lightbond, Padlock, Flow Tain); Shofu (Beautiflow, Beauti II); TP Ortho (Exact); Ultradent (Opal). Two different curing light sources were used (1) a blue-only LED light (Smartlite Focus 5, Dentsply, peak output at 475 nm to test for CQ reactivity) and (2) a violet-only LED (Ultralume 5 (used with only violet activation), peak output at 392 nm to test for alternative photoinitiator content). Five discs of each material were exposed for 10S, and allowed to post-cure for 24h at 37°C in the dark. Stored specimens were subjected to flexural testing in a pin-on-disc test jig in a universal testing machine. Force at specimen failure (Newtons) were recorded. Unpaired, 2-tailed Student's t-tests were performed between strength values using the different lights within the same product. The radio of strength between blue light exposure and violet light exposures were determined. All statistical testing was performed at a pre-selected alpha of 0.05.

RESULTS: The only product where disc strength values were not significantly different between blue and violet lights was Connect (p=0.136). Ratios of strength (B/V) provided a scale from 1.3 (Connect) to 22.1 (Flow Tain). Correlation of manufacturer light wavelength with strength ratio indicated that ratios above 1.8 were probably associated with materials containing only CQ.

CONCLUSIONS:

Very few orthodontic bracket adhesive pastes indicated the presence of photoinitiators other than CQ. Thus, use of blue-only LED units would prove satisfactory for photocuring the majority of light-cured orthodontic brackets pastes.

LEARNING OBJECTIVES:

1. State potential issues related to application of different wavelengths of light when photocuring orthodontic bracket adhesive pastes.
2. State the wavelength range within with CQ or the alternative photoinitiators are most reactive.
3. State the probable photoinitiator present in the great majority of light-activated bracket adhesives, and the wavelength of light that is most responsible for providing bracket adhesive curing, and thus potentially bond strength to the tooth.