INTRODUCTION

PROBLEM:
Clinicians do not know if selection of light curing unit (LCU) and composite is brand-dependent for obtaining optimal composite depth of cure (DOC). I.e. Will a blue-only LED provide as deep a cure as a polywave LED, when the composite contains different photoinitiators and is made by a different manufacturer than the light?

SIGNIFICANCE:
If clinicians knew, with certainty, that a specific type LED LCU provides optimal DOC of a composite from the same manufacturer, then perhaps restorations photo-cured under such “best combinations” would yield the maximal clinical results.

PURPOSE

1. To measure and compare DOC values of layered and bulk-fill composites having different photoinitiators when exposed to blue-only or polywave LED curing lights.
2. To correlate spectral irradiance of the LCUs with measured composite DOC values (incident and at-depth).

HYPOTHESES

1. For a given composite, optimal DOC will be observed when using a LCU from the same manufacturer.
2. Composite DOC is related to photoinitiator content and LCU irradiance within the spectral region of photoinitiators absorbances at composite depths.

METHODS

COMPOSITES

LAYERED:
- HERCULITE ULTRA A2 DENTIN (CQ)
- TETRIC EVO CERAM A2 DENTIN (CQ / TPO)

BULK-FILL:
- SONICFILL A2 (CQ)
- TETRIC EVO CERAM BULK IV A (CQ / TPO / IVOCERIN)

CURING LIGHTS

BLUE-ONLY LED
- DEMI ULTRA: KERR

POLYWAVE LED
- BLUEPHASE STYLE: IVOCLEAR/VIVADENT
- SILVERLIGHT: GC
- VALO CORDLESS: ULTRADENT

RESULTS

CONCLUSIONS

1. For only 1 MFG did composite/light combination create best DOC
2. DOC is related to depth of penetration of blue light – thus only CQ activation
3. In all instances blue-only LED outperformed polywave lights – even with multiple initiators present
4. ISO 4049 DOC test is not a clinically relevant – should test at MFG-recommended increments – and use realistic tip-to-target distances

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