Research & Table Clinic Day 2022 Structured Abstract

TITLE: Commercial Post-Cure unit and a UV Hand-gel Light Irradiance Differences

OBJECTIVES:

3D printing users often use off-brand devices for providing post-cure polymerization of 3D photo-fabricated devices: such as inexpensive UV hand-gel lights. This project sought to determine differences in spectral irradiance between two types of post-curing devices

METHODS:

A commercial 3D post-curing unit (Pro-Cure, SprintRay) and a commonly used hand-gel photo-polymerizer (2 units taped together to provide 360 deg of light coverage) (DR-301C, Melody-Susie) were tested. A small spectroradiometer (calibrated to methods traceable to a NIST standard) (STS-VIS-L-100-400-SMA with CC-3-DA detector) as placed into each unit, with the detector end positioned within the center of the unit volume. Calibrated spectra were obtained at each 45 deg position in that central position to obtain information simulating exposure of an as-printed specimen being post-cure irradiated. Five replications were made at each radiometer position. Within each unit, a 1-way ANOVA was performed to determine differences in irradiance values among the various measurement locations. An unpaired, 2-tailed Student's t-test was performed between total irradiance values of both units.

RESULTS: (If applicable)

The commercial device emitted radiation in two strong wavelength peaks: 369 and 402 nm. The UV unit produced one very strong emission: 370 nm, plus a variety less strong peak. 2-way ANOVA indicated significant differences ($p<0.001$) in irradiance values among various positions within each post-curing device, with many more differences in locations seen in the commercial unit. The t-test indicated significant difference in irradiance between the two units ($p<0.001$): Commercial 14.8 (+/-4.2) mW/cm^2; UV unit 5.5 (+/-4.2) mW/cm^2.

CONCLUSIONS:

Personnel fabricating 3D photo-cured devices need to be aware of the significant differences in delivered irradiance to objects being post-cured in commercial and non-commercial devices for this treatment. Such differences could significantly impact the final properties of the fabricated part.

IMPLICATIONS:

Post-curing of 3D printed items is a critical step in developing a strong, dimensionally accurate, biocompatible item. Knowledge of the conditions under which freshly printed materials are post-cured will lead to better, and more consistent results as well as in trouble shooting when items are failing.

LEARNING OBJECTIVES:

1. State the purposes of post-curing 3D-printed resins
2. State differences among various types of post-curing units
3. Identify differences in and implications of spectral distribution and specimen incident irradiance values from different post-curing units

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FOR MENTORS:

By digitally signing this form, you affirm that you have reviewed the contents of the abstract and agree to submit it for presentation at the 2022 RTCD.

If yes, please enter your digital signature here	Frederick A Rueggeberg Digitally signed by Frederick A Rueggeberg DN: cn=Frederick A Rueggeberg, o=Dental College of Georgia at Augusta University, ou=Department of Restorative Sciences, email=frueggeb@augusta.edu, c=US Date: 2021.11.03 14:27:28 -04'00'