AbstractID: 11560 Title: Quantitative Light Dosimetry in Air Using Spherical Optical Fiber Detector

Purpose: To quantitatively evaluate current clinical dose calculations delivered by cylindrical diffusers used in superficial Photodynamic Therapy (PDT) treatments. **Method and Materials:** A setup was developed to investigate light irradiance patterns in air ranging from 2-50mm of Source to Detector Distances (SDD), distances customarily used in superficial PDT treatments. A 630 nm PDT diode laser light source was used in junction with diffusers ranging from: 10, 20, 25, and 50 mm. The detector was mounted on an optical bench along varying SDDs. The irradiance was then measured using a spherical optical fiber detector (1.8-mm diameter), which was calibrated against a 1cm×1cm window photodiode detector (Ophir PD300-3W traceable to NIST) connected to a power meter. Finally, sets of predicted irradiance values were calculated under typical clinical conditions by dividing the total power by the cylinder area bounded by the SDD. **Results:** The measured and predicted values were plotted and compared. For the 10mm diffuser, at approximately 50mm SDD, the predicted value was nearly fourteen times greater than that of the measured. For the larger diffusers, the disparity between the predicted and measured results narrowed. For example, the 50mm diffuser, at the same distance as that of the 10mm, predicted an intensity of only two times greater than that of the measured. **Conclusion:** Agreement between measured and predicted irradiance values is expected to occur for a hypothetical infinite length diffuser or for small SDD. The results however, revealed that at large distances from the source, with respect to the diffuser size, the theoretical results diverge from those obtained experimentally. Therefore, the current dose calculation should be reviewed for clinical PDT, as the understanding of the irradiance in air is paramount for the correct calculation of light dose delivered in PDT treatments.

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