Comparison of Two Dosimetry Systems for PDT Light Monitoring

On-line monitoring of light delivery is essential in PDT to ensure proper dosing to critical structures. Earlier light dosimetry for PDT human clinical trials was performed with a flat photodiode detector system that measured the light flux coming directly from the source. Recently, attempts have been made to use spherical (isotropic) fiber optic detectors that measure the light *fluence* rate. Decreased angular dependence, much smaller probe size, and easier handling, also favor the use of spherical detectors. The comparison of doses measured simultaneously by spherical and flat detectors, both in tissue phantoms, and in PDT human clinical trials is analyzed here. Patients undergoing PDT were given Photofrin® 48 hours prior to surgery. After the debulking surgery, flat photodiodes and spherical detectors were placed side by side in representative locations, and simultaneous *in vivo* dosimetry was performed with both systems. The readings of the spherical detectors were between 1 and 3 times larger than the readings of the flat detectors, with an overall average of 1.75±0.23, independent of location. Thus, for a set value of the dose measured with the flat detectors, considerable variability was found among the measurements made with the spherical probes. Phantom experiments and theoretical considerations indicate that the observed variation in signal can be explained by changes in optical properties of the underlying tissues. The observed heterogeneity provides a measure of *in vivo* tissue optical property variation, with deeper implications for light penetration and light dosimetry.