

AbstractID: 11223 Title: Application of optically-stimulated-luminescence dosimeters in partial-breast-irradiation brachytherapy

Purpose: To study the application of in-vivo optically-stimulated-luminescence (OSL) dosimeters in high-dose-rate (HDR) partial-breast-irradiation (PBI) brachytherapy. **Methods and Materials:** In PBI brachytherapy treatment planning using HDR Ir-192, one of the organs at risk is the skin. With the recent clinical introduction of multi-dwell position and multi-lumen PBI treatment devices, optimization dose algorithms allow improved treatment volume (PTV-EVAL) dose distributions. However this gain in improved tumor volume coverage may oftentimes be at the risk of increasing the overlying skin tissues to radiation tolerance doses. Hence, there is increasing concern to validate the calculated skin dose with experimental in-vivo determinations. Using Landauer OSL chip dosimeters, we clinically measured the dose to a reference point in the skin surface and correlated this measured dose with our treatment planning computer predictions. Location of calculation points was validated using surface markers via computed tomography. Care was taken to provide 1-cm thickness of 4 x 4-cm²-area backscatter-factor material. **Results:** The chip dosimeters were calibrated using a 6-MV-linear-accelerator-photon beam. Mean dose measured values on two patients to date were within 3% of error with respect to the planned values. **Conclusions:** OSL dosimetry provided a direct way to measure in-vivo doses for HDR brachytherapy procedures, verifying accuracy for 380-keV average photon energy. Our treatment protocol now includes these dosimeters for estimation of skin dose. We will discuss specific energy response differences and dose calibration procedures for the OSL dosimeter for application using HDR Ir-192 brachytherapy. Accuracy, versatility of placement and straightforward way of reading these dosimeters make them a valuable alternative to thermoluminescence, diode and MOSFET-based dosimeters.

Conflict of interest: This study is sponsored by Landauer, Inc., Glenwood, Illinois