AbstractID: 7664 Title: Evaluation of an implantable dosimeter for measuring dose in CyberKnife treatment: experimental methods and preliminary results.

Purpose: Determine the performance of an implantable MOSFET dosimeter (Sicel Technologies, Morrisville, NC) for hypo-fractionated SBRT regimens using CyberKnife (CK) (Accuray, Inc, Sunnyvale, CA). Evaluate response as a function of collimator size, dose fractionation, and delivery time utilized in CK. Determine dosimeter accuracy for CK treatment for various diseases, and validate it for clinical implementation as an in-vivo dosimeter and as a fiducial for CK tracking (previously demonstrated).
Method and Materials: A custom-made solid water phantom at 22°C and a liquid water phantom at 37°C were used for initial studies. For the collimator study, dosimeters were calibrated at 200 cGy. Measurements were made in solid water and normalized to the 60 mm collimator. For the dose regimen study, doses of 700, 1000, and 1200 cGy/fx for 5 fractions were evaluated using high-dose calibrated dosimeters. Dosimeters were irradiated in both solid water (room temperature) and liquid water (body temperature). Dosimeter response as a function of treatment time (ranging from 30-90 minutes) was analyzed using the solid water phantom. An anthropomorphic body phantom with water-filled dosimeter holders at 37°C was irradiated using ten patient treatment plans. Dosimeter doses were compared with calculation, as well as with ion chamber and diode measurements.
Results: Collimators in the range of 25-50 mm showed minimal variation (<3%) when normalized to the 60 mm collimator. The dose fractionation study showed an average deviation from predicted doses in the range of -0.9% to 4.4%.
Conclusion: The dosimeters are accurate, on average, to within 5% in the phantom testing performed with CK. While results to date are very encouraging, further study is necessary prior to clinical implementation of this device as both a CK tracking fiducial and an in-vivo dosimeter.

Conflict of Interest: NONE