AbstractID: 8808 Title: Evaluation of an implantable MOSFET dosimeter for use with hypo-fractionated external beam treatments

Purpose: Evaluate the performance of an implantable MOSFET dosimeter designed for hypo-fractionated protocols.
Method and Materials: The DVS® implantable dosimeter has been developed for use with external beam radiotherapy. A new version is currently under development for use with hypo-fractionated protocols (DVS-HFT*). This dosimeter is pre-calibrated for use at body temperature in a dose per fraction range of 340-1200 cGy. The dosimeter response was evaluated in a water phantom at 37ºC to validate the accuracy as a function of dose. Since delivery times for high dose fractions can vary, a study of the response as a function of treatment time was performed. In addition, dose rate dependency for high doses was evaluated. Final dosimeter accuracy was validated by delivering simulated hypo-fractionated treatments on a body phantom at 37 ºC. Two dosimeters each (total six) were irradiated inside the phantom with a breast BID plan at 340 cGy per fraction (10 fx), two prostate IMRT plans at 700 cGy per fraction (5 fx) using 6 MV and 18 MV.
Results: The dosimeter had minimum dependency on dose fraction size from 340 to 1200 cGy. Phantom testing found a response accuracy of <6% for 50 dosimeters tested with different doses and fractionation schemes. Dose rate dependence measurements in the range of 300 to 600 MU/min showed <0.6% variability. The dosimeter was found to have a slight dose response fall off as a function of fraction number for irradiation times larger than 1 hour. Simulated clinical treatments on six dosimeters resulted in an overall accuracy of -0.65% (σ=1.9%).
Conclusions: Hypo-fractionated treatments have fewer fractions requiring increased treatment accuracy. Phantom testing suggests that the DVS-HFT could be used to measure the dose per fraction delivered helping optimize hypo-fractionated treatments.

*Not FDA cleared for use in the US
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