AbstractID: 12889 Title: Dosimetric evaluation of an implantable DVS-HFT dosimeter for hypo-fractionated radiation treatment

Purpose: To evaluate the dosimetric accuracy and reproducibility of an implantable DVS-HFT dosimeter for hypo-fractionated radiation treatment in stereotactic radiotherapy.

Method and Materials: The dosimeters are factory calibrated to read within the range of 340-950 cGy per fraction. Communication from the detector to the reading device is achieved telemetrically. Two sets of dosimeters were studied in a phantom and one set is implanted in a prostate cancer patient treated with five fractions. The planned doses to detectors were calculated based on CT images. The calculated doses were validated with ionization chamber measurements in the phantom. Both static and IMRT beams were studied. The uncertainty of dosimeter reading was estimated by $\Delta\% = \frac{\text{detector reading} - \text{Planned dose}}{\text{Planned dose}} \times 100\%$

Results: In the phantom studies, the uncertainty of daily readings were found to be from -0.1 to -4.9% (with a mean value of -1.6%) and from +1.4 to +4.8% (with a mean value of +2.5%) for five daily doses of 700 cGy delivered by static and IMRT beams respectively. For the dosimeters implanted in the prostate cancer patient, the daily discrepancies between dosimeter-1 readings and calculated doses of 767 cGy range from -8.2% to +4.0% (with a mean value of +2.0%) during five fractions. However, the discrepancies of dosimeter-2 implanted in a region with high dose gradients (calculated dose of 180 cGy) range from -4.3% to +35.0% (with a mean value of +3.4%).

Conclusion:

The accuracy of the DVS-HFT dosimeter is shown to be within the manufacture stated uncertainties of < 5.5%. The study demonstrates that the dosimeter may be an effective tool to determine the actual dose delivered to treatment targets as well as organ at risk. The information obtained can be utilized to study actual dose fluctuations of daily treatment.

Conflict of Interest (only if applicable):

Two sets of dosimeters used in phantom study were provided by Sicel.