AbstractID: 8246 Title: Response of an implantable MOSFET dosimeter to ¹⁹²Ir HDR radiation

Purpose: To characterize the response of implantable MOSFET dosimeters to ^{192}Ir HDR radiation.

Method and Materials: Sicel Technologies, Inc. has developed an implantable MOSFET detector that is read telemetrically by an inductively coupled antenna. All tests were performed in Virtual Water™ phantoms. To test detector response to dose rates near those delivered by ^{192}Ir HDR sources, detectors were irradiated at four SADs by a ^{60}Co source. Detector response to ^{60}Co relative to ^{192}Ir energies was tested by alternating fractions between ^{60}Co and ^{192}Ir. The effect of accumulated dose was tested with detectors at 3, 4, and 5 cm from an ^{192}Ir source. The rotational and longitudinal angular responses were tested by irradiating the dosimeters at varying orientations around the source.

Results: Differences in detector response due to varying ^{60}Co dose rates were not statistically measurable. The detectors were more sensitive to ^{192}Ir than ^{60}Co energies, and demonstrated a nonlinear accumulated dose effect. This effect was characterized by three third-order polynomials fit to data from detectors placed at three different distances from the source. The detectors have little angular dependence except when the detector is irradiated with the coil and electronics assembly aligned between the MOSFETs and incident radiation. This orientation causes a -15.3% difference in response.

Conclusion: Dose rates between 22 and 84 cGy/min do not measurably affect detector response. The energy response and accumulated dose effect have been characterized. The angular response of the detectors is minimal except when the MOSFETs are irradiated through the coil and electronics assembly. This effect may be minimized by establishing proper orientation in implantation protocols. A calibration curve obtained with ^{192}Ir would allow the dosimeter to be used for absolute dose measurements with ^{192}Ir HDR radiation.

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