AbstractID: 1981 Title: Evaluation of a minimally invasive implantable radiation dosimeter

Precise dose delivery is of paramount importance for optimal tumor control through radiotherapy. It is only through the measurement of the actual dose at depth that the degree of uncertainty associated with computationally intractable variables such as tissue inhomogeneity, software planning errors, patient setup errors, and organ movement can be assessed and utilized for treatment planning purposes. The goal of using implantable radiation dosimeters is to provide a novel quality assurance device to measure the true dose delivered during any single treatment fraction or the entire course of therapy. The efficacy and precision of novel implantable radiation detectors developed by Sicel Technologies Inc. (Morrisville, NC) have been investigated and evaluated *in vitro* by using a Co-60 beam as the source of ionizing radiation. These detectors serve a dual purpose as radiation dosimetry devices and radiographic fiducial markers. The sensors in these devices make use of MOSFET radiation detector microchips. These devices are 25.5 mm long and 3.25 mm in diameter and the entire electronic assembly in each device is encapsulated in a hermetically laser sealed glass coated in Parylene C. The data obtained through our measurements show that under identical irradiation conditions the actual threshold voltage shift for all the detectors agree to within ±1%. The extrapolated second degree polynomial fits of these data agree to better than 0.3%. We have found that the maximum dose tolerance of these detectors, before exhibiting damage to the electronic circuitry or compromising the microchip integrity, is between 100 –120 Gy.