

AbstractID: 3991 Title: Comparison of PDR Iridium and LDR Cesium through Monte Carlo simulation

Purpose: Pulsed dose rate (PDR) ^{192}Ir has been proposed as a substitute for intracavitary ^{137}Cs brachytherapy because it radiobiologically mimics LDR treatments. Monte Carlo calculated doses to the ICRU 38 reference points show that PDR delivers a dose distribution that is comparable to that delivered by LDR ^{137}Cs .

Methods and Materials: After validation of the Monte Carlo model using published data for a single source and radiochromic film measurements around a single shielded ovoid, the tandem and ovoid applicator system were modeled using Monte Carlo geometries. Treatment plans using the PDR source were created in Varian's Brachyvision software simulating the isodose shapes produced in a typical Cesium plan. These plans were recreated in Monte Carlo input files. A shielded and an unshielded version of each patient's treatment plan was created to ascertain the effect of the shields on the reference points.

Results: The results showed that Monte Carlo calculations for the unshielded model to the standard ICRU 38 reference points agreed well with Brachyvision's calculations to these points. Results from the shielded model showed no significant affect to points A and B, but significant change to the bladder and rectal points. An average shielding effect of 12.7% was observed for the bladder point and an average effect of 29.4% was observed for the rectal point.

The results were compared with data from a previous Cesium study involving the same patients. Doses to points A and B were similar. The shielding showed greater effectiveness with PDR for the bladder and rectum.

Conclusion: A Monte Carlo model was developed to simulate representative clinical dose distributions from a PDR Iridium source in a shielded GYN applicator. The calculations demonstrate that PDR Iridium can be substituted for conventional LDR Cesium brachytherapy.