

AbstractID:9602 Title : TG-43 Parameterization of a Novel Brachytherapy Source Design of Multi-Radioisotope

Purpose: Applications of ^{125}I and ^{103}Pd sources in brachytherapy treatment of prostate cancers, with long and short doubling time, respectively, are well established. However, for treatment of prostate cancer composed of cells with different doubling time, a brachytherapy source with mixture of ^{125}I and ^{103}Pd radioisotopes might be more desirable. In this project, dosimetric characteristics of a novel brachytherapy source, composed of a mixture of ^{125}I and ^{103}Pd radioisotopes, has been determined following AAPM TG-43U1 protocol.

Material and method: A new brachytherapy source model, ADVANTAGE™ HYBRID PdI, has been designed by IsoAid™, LLC for treatment of prostate cancer. A dose calculation model was developed to determine the dosimetric characteristics of this source design. In this model, the Monte Carlo simulated parameters from each isotope of the source were individually determined assuming 50% dose contribution from each isotope. These values were then utilized for determination of the parameters of the mixed source. The outcomes of these investigations have been incorporated in the VarisSeed planning system for the evaluation of an actual clinical case.

Results: The results of these investigations indicated that the dose rate constant of the source with 50% dose contribution from each isotope is 0.699 cGy/hr/U. The radial dose function, 2D- and 1D-anisotropy function of the new source design have been tabulated for clinical applications. The tolerance of each parameter was evaluated for isotope variation within the source. The percent variation of V_{100} and D_{90} were found to be less than 1% and 4%, respectively, which are within the acceptable range.

Conclusion: The TG-43 dosimetric parameters of a multi-isotope source have been determined for clinical applications in the treatment of prostate cancer with tumors composed of cells with variety of potential doubling times.

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