

AbstractID: 9558 Title: Dosimetry of Curvilinear Brachytherapy Sources using TG-43U1 Formalism

Purpose:

TG-43U1 recommendation for dosimetric characteristics of brachytherapy sources with active length of <1 cm does not include the possibility of source deformation during the clinical procedure. However, this assumption may not be valid for elongated (active length > 1 cm) sources. In this project, the impact of the source curvature on its dose distribution will be evaluated for elongated Pd-103 sources.

Material and method: The MCNP5 Monte Carlo simulation code has been used to calculate the dose profiles around for Pd-103 sources with active length >1 cm. The calculated dose profiles for various curvatures have been compared to the values from a straight line source with the same active length. The dose calculation points are considered every 0.5 cm from each other and 0.5 cm away from the inner surface of the curvilinear source.

Results: The results of the dose rates inside and outside of a 5 cm long RadioCoil™ Pd-103 source as a function of distance from the center of the source have been compared with line source of same length. It is found that, at the mid level of the source, the dose rate is 50% higher in inner dose calculation points and 10 % less in outer points as compared to dose rate from a line source geometry. However, at 2.5 cm distance from the middle of the source, dose rate for inner point is only about 30% of the straight line source.

Conclusion: Dose calculations for elongated curvilinear sources have been evaluated which was not introduced in TG-43 dose calculation algorithms. The results of these investigations indicate that the degree of the curvature should be considered to achieve accurate dose calculations in a clinical practice.