

AbstractID: 10743 Title: A Monte Carlo based Dose Calculation and Evaluation Toolkit for Electronic Brachytherapy: Feasibility of IMBT

**A Monte Carlo based Dose Calculation and Evaluation Toolkit for Electronic Brachytherapy: Feasibility of IMBT**

**Purpose:** To develop a Monte Carlo based dose calculation and evaluation toolkit for electronic brachytherapy sources, capable of simulating Intensity Modulated Brachytherapy (IMBT). **Material and methods:** This toolkit used Monte Carlo code EGS4 to calculate the dose distribution for a treatment in a realistic virtual human phantom converted from the patient's CT images and contours. An in-house Matlab program was developed to analyze the dose distribution and generate DVHs and isodoses. **Results:** The system was benchmarked by comparing the calculated radial dose functions (in water) with experimental data published. Difference was within 3%. A typical intracavitary accelerated partial breast irradiation (APBI) treatment plan using Xofigo electronic brachytherapy source was simulated using this toolkit. DVHs and isodoses revealed that the dose to the ribs were high in this plan due to proximity of balloon to the chest wall and the high absorption coefficient of bone to low energy X-rays. A simple IMBT plan using partial block could conform the isodose distribution to the target, reduce the dose to ribs and chest wall without compromising the dose homogeneity to the target or increasing the dose to other critical structures. **Conclusion:** A Monte Carlo based dose calculation and evaluation system was developed for electronic brachytherapy sources. Benchmarked through published data, this system is capable of producing reliable and detailed dose distributions for both isotropic and intensity modulated sources. The feasibility of intensity modulation in improving the plan quality was proved.