AbstractID: 8576 Title: Treatment planning for complex brachytherapy dose distributions using high-Z shields and conventional software

Purpose: Certain brachytherapy dose distributions, like for LDR prostate implants, are readily modeled by treatment planning software using the superposition principle of individual seeds to replicate the total dose distribution. However, dose distributions for brachytherapy treatments using high-Z shields are currently not well-modeled using conventional software. **Method and Materials:** Dose distributions from complex brachytherapy plaques determined using Monte Carlo methods were used as input data, and included COMS-based eye plaques using ^{125}I, ^{103}Pd, and ^{131}Cs; 4-8cm diameter AccuBoost peripheral breast brachytherapy applicators from Advanced Radiation Therapy; and the 2 and 3cm diameter Valencia skin applicators from Nucletron Corp. Radial dose functions, g(r), and 2D anisotropy functions, $F(r,\theta)$, were obtained by positioning the coordinate system origin along the dose distribution cylindrical axis of symmetry. Origin:tissue distance and effective active length, L_{eff}, were chosen to minimize g(r) and $F(r,\theta)$ interpolation. Dosimetry parameters were entered into the Pinnacle treatment planning system, and dose distributions were subsequently calculated/compared to the original Monte Carlo-derived dose distributions. **Results:** The planning technique was able to reproduce complex brachytherapy dose distributions for all three plaque types. Agreement improved as distance from the coordinate system axis decreased, 1% errors on the axis were attributed to g(r) interpolation. Agreement was best for the Valencia applicator and worse at the plaque edge for COMS eye plaques and the AccuBoost applicator. Agreement between input and planned dose distributions improved as the spatial resolution of the fitted dosimetry parameters improved. For agreement on the order of 1%, dosimetry parameter spatial resolution of 1mm was required, and the $F(r,\theta)$ dataset included over 1,000 datapoints. **Conclusion:** A new technique was developed to simulate complex brachytherapy dose distributions in tissue using conventional treatment planning software. These results should be generalizable to other source types and planning systems. **Conflict of Interest:** Research sponsored by Advanced Radiation Therapy.