AbstractID: 2039 Title: Monte Carlo Invesitgation of Possible Underdosing of Small Lung Tumors

Detailed Monte Carlo calculations have indicated that the traditional methods of calculating dose to lung cancers from external beam radiation therapy may be overpredicting the dose deposited in tumor tissue adjacent to lower-density lung tissue. The resulting underdosing of small tumors and peripheral regions of large tumors could be a contributing factor to the high local recurrence rates for lung cancer patients. In this work, we study the extent of this underdosing effect by simulating a variety of tumor shapes and beam configurations on a CT patient model using the EGS4-based Monte Carlo codes BEAM and MCRTP. Initial tumor studies performed include high-resolution (< 2mm) dose calculations on healthy lung tissue, large tumor masses, small tumors in the vicinity of large tumors, and thin tumor tendrils. Studies on healthy lung tissue show good agreement between conventional calculation methods and Monte Carlo calculations. Calculations performed on large tumors show agreement on dose deposited deep within the tumor tissue, but indicate that conventional calculations are underpredicting the dose deposited at the tumor periphery by as much as 25%. Comparisons of large and small tumors in the same beam show relative underdosing of the small tumor as high as 18%, depending on beam margin and energy. Studies of thin tendrils of tumor tissue show a similar degree of underdosing, with a significant variation of total dose for different tendril orientations with respect to the beam direction.

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