

AbstractID: 6413 Title: Dosimetry of Small Pulmonary Nodules: A Comparison Between Treatment Planning Calculations and In-Phantom Measurements

Purpose: To evaluate the accuracy of three commercially available treatment planning systems (Philips Pinnacle, Brainlab Brainscan, and Radionics Xknife) in their ability to calculate dose distributions delivered to small pulmonary nodules.

Method and Materials: A radiological equivalent lung phantom consisting of cork (0.26 g/cm^3) and acrylic spheres (~1, 2, and 4 cm diameters) was constructed to simulate the presence of solitary pulmonary nodules. Single beam, 3D conformal, and IMRT treatment plans were generated for the lung phantom on each planning system. Evaluation was accomplished by comparing the dose distributions predicted by each planning system to the in-phantom dose distributions measured with radiochromic film. Evaluations were made based on dose profiles and gamma analysis.

Results: For single beams, the location of the largest disagreement between the measured and predicted dose distributions occurred at the distal side of the embedded nodule. The differences between measured and predicted doses in the distal edge of the medium sphere were 3%, 8%, and 23% for Pinnacle, Brainscan, and Xknife respectively. For 3D conformal medium sphere plans the largest differences between measured and predicted doses were 2%, 11%, and 13% for Pinnacle, Brainscan, and Xknife respectively. Gamma analysis showed the largest errors at the nodule/lung interface. Similar results were found for the IMRT plans. The largest errors were found for the smallest nodules in all three systems.

Conclusion: As expected, the collapsed cone convolution algorithm of Pinnacle yielded the best agreement between predicted and measured doses in solitary lung nodules, with the largest differences at 3-5% for single beams, 3D conformal and IMRT plans. Brainscan and Xknife differed at points from 4% to 23% for the single beams, 3D conformal and IMRT plans. A systematic review of the results will be presented.

Conflict of Interest (only if applicable):