AbstractID: 6432 Title: The importance of accurate dose calculation for treatment planning of patients with small lung tumors

Purpose: To evaluate the accuracy of different dose calculation algorithms for treatment planning of patients with small lung tumors, film measurements in a heterogeneous phantom are performed. The measured dose distributions for two photon energies (6 MV and 15 MV) are compared to calculations with Pencil Beam (PB), Collapsed Cone (CC) and Monte Carlo (MC).

Method and Materials: The phantom is made of solid water slices and styrodur. The center of the phantom contains a solid water cylinder modeling the planning target volume (PTV). Radiographic films are placed between the slices. Treatment plans consisting of 9 conformal beams with directions uniformly distributed around the PTV cylinder and two different photon energies (6 MV and 15MV) of a standard linear accelerator are created. Dose calculations are performed with the three algorithms. The calculated dose distributions are compared to dose profiles extracted from the film exposure after irradiating the phantom.

Results: The best agreement (independent on the energy) can be observed between the film and MC profiles. The PB algorithm fails to reproduce the measured dose distribution. The CC results show good agreement for 6 MV and an acceptable agreement for 15 MV inside the PTV cylinder. The CC dose outside of the PTV in the styrodur material is overestimated for 15 MV. Both, MC and CC algorithms predict the absolute dose measured with ionization chamber at the isocenter with an accuracy of at least 3%. The absolute dose deviation of the PB algorithm is 4% for 6 MV and 10% for 15 MV.

Conclusion: For treatment planning of patients with small lung tumors the use of PB algorithms should be avoided. CC algorithms provide good accuracy for low energies; MC algorithms provide good accuracy for low and high energies.

Conflict of Interest: “Research sponsored by BrainLAB AG.”