

AbstractID: 3030 Title: Effects of the Intravenous Contrast on Dose Distributions

Purpose: To quantify the effects of the intravenous CT contrast media on the dosimetry for 3D conformal and IMRT Treatment Planning.

Method and Materials: OPTIRAY 300 contrast agent (300 mg/ml organically bounded Iodine, Mallinckrodt Inc.) with the typical injection rates of 0.5 ml/sec for the brain tumor sites and 1.0 ml/sec for the abdomen tumor sites was used in our studies. Two CT data sets were acquired for each patient under study: one control CT set without the contrast, and one with the contrast as for the regular treatment planning. Both 3D image sets were co-registered. The contrast enhanced CT set was used for creating the treatment plan and then that plan was mapped with the identical parameters onto the non-contrast CT set to simulate the dose distributions under clinical conditions. The built-in inhomogeneity correction was used for calculating the dose distributions for both CT sets. Effects for tumors in the brain, abdomen and lung were studied.

Results: Depending on the treatment site, the complexity of the plan, the beam distributions and pathlength traveled through the contrast enhanced regions, the dose difference calculated was as high as ~3%. The deposited dose calculated based on the contrast enhanced CT set can be an over-estimate or an under-estimate, depending on the ratio of the contrast content in the tumor volume versus that in the beam pathway.

Conclusion: While no clinically significant effect was observed in our tests for the fractionated therapy, the calculated dose difference caused by the intravenous contrast media at the simulation time is an additional systematic factor that contributes to the total delivered dose uncertainty. We expect to see more complicated effects in the IMRT treatment plans with complicated field fluences. Also for the stereotactic radiosurgery treatments 3% dose difference may deem the plan to be unacceptable.