

AbstractID: 10971 Title: IDosimetric feasibility of patient-specific margins for prostate patients using a wireless localization and tracking system

Purpose: The purpose of this work is to investigate the potential dosimetric benefits of designing patient-specific margins for prostate cancer patients based on an observation of prostate motion during the initial few treatments using a 4D localizing and tracking system.

Method and Materials: 10 prostate cancer patients were localized and tracked using the Calypso Localization System. These patients were treated with a margin of 10 mm in all directions and 7 mm posteriorly from the CTV. All patients were first localized and then tracked for the entire duration of treatment for all fractions. The tracking data was used retrospectively to determine the individualized margin. The daily standard deviations of motion in all three directions were used to ascertain if after a certain number of fractions, the motion could be predicted for the remaining fractions. Another set of plans with a uniform margin of 5 mm was also developed, as this is the typical margin used by centers which performed some form of image guided treatment. Plans with the same constraints were generated for all three of these margin sets. The resulting plans were compared.

Results: For all of the 10 patients, 3 standard deviations calculated for the initial 5 days of treatment, resulted in at least 95% coverage of the CTV for the whole treatment. Individualized margins were therefore, calculated based on 3 standard deviations. The individualize margin generally creates the smallest PTV volume. The smaller the margin used to create the PTV, the greater the dosimetric advantage.

Conclusion: For all 10 patients, the intra-fraction motion was predictable based on the initial 5 fractions. It suggests that individualized margin optimization is feasible without compromising on CTV coverage. Based on our data a uniform margin of 5 mm may not be adequate for some patients.