

AbstractID: 10784 Title: Cumulative Dose to the Rectal Wall and Implications for Prostate IGRT Treatment Planning

Purpose: To investigate the effect of daily variation in rectal volume and shape on dose to the anterior rectal wall in prostate IMRT.

Method and Materials: A patient data set was used, consisting of a planning image and a sequence of treatment images (in-room CTs) acquired over the course of IGRT. 5-beam IMRT plans (prescription dose 46 Gy) were generated using three different daily treatment CTs as the planning image, with rectal volumes of 77 cc, 89 cc, and 158 cc. For each plan, the daily treatment dose was computed under optimal prostate alignment on all daily images. Dose to the rectal wall was then accumulated to a single image using a landmark-registered deformable model to determine correspondence. The planned and cumulative rectal wall dose distributions were displayed in a rendered 3D surface display for comparison.

Results: The only substantial change in the peak rectal dose occurred when the treatment was planned on the day with the most distended rectum, when the delivered peak dose was ~5% less than that planned. For the other two planning images, with a medium or small rectum, the change in dose to the hot spot was less than 2%. Examination of each day showed that the rectal wall was closest to the prostate on the day with the largest rectum, so that, when the rectal constraints were satisfied for that case, the resulting dose distributions had a lower maximum on other days for which there was separation between the two organs. The surface displays indicated some spreading of dose due to organ motion.

Conclusion: With growing accuracy of prostate setup, the relative motion of other organs may merit separate consideration in planning. A study extending this work to images from 5 patients is under way.