

AbstractID: 2667 Title: Monte Carlo calculation of rectal dose when using an endorectal balloon during prostate radiation therapy

Purpose: Air-filled intrarectal balloons can be used to localize and immobilize the prostate for radiation therapy. This project investigates how well the Eclipse treatment planning system (Varian Inc.) includes the effect of this potentially significant heterogeneity on doses to the rectum.

Method and Materials: The BEAMnrc/DOSXYZnrc Monte Carlo (MC) codes were used to simulate a 4-field conformal therapy treatment for patients who have been treated for prostate cancer under an IRB-approved protocol which includes a 27Gy cone-down using a rectal balloon. The rectal doses calculated using MC were compared with those from Eclipse using isodose curves, dose-volume histograms, and wall-volume histograms.

Results: The MC results showed that, for a 27Gy prescription to the 95% isodose line, Eclipse over-estimates the volume of the rectum receiving more than 26 Gy by 2-10cc and the volume of the rectum receiving between 12-15 Gy by 10-20cc.

Conclusion: The differences in the rectal dose calculated by Eclipse and MC are consistent and can be predicted. They can be explained by the scattering behavior of the PA and lateral fields inside the balloon: For each field, the lack of electronic equilibrium reduces the high dose region while the increased electron range widens the low dose region beyond the penumbra. The combined effect of the four fields divides the DVH into two major regions, corresponding to the AP-PA and lateral fields, and four subregions, corresponding to the scattering behavior of electrons in air.