

Comparison of Dosimetric Effects of Hydrogel Spacers in PBS & IMRT Treatment for Prostate Cancer

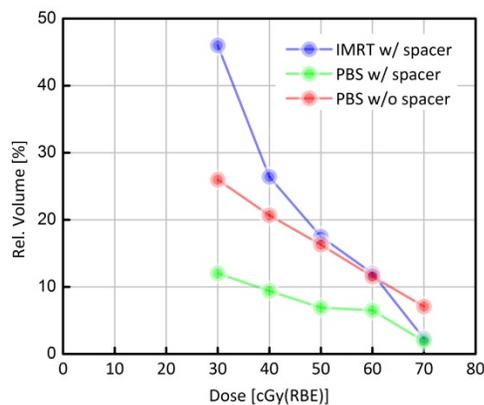
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INTRODUCTION: Hydrogel spacers have been used for creating larger separation between prostate and rectum. Increasing the space between the anterior rectal wall and the prostate has been shown in planning studies to reduce the rectal dose. We compare the dosimetric effects of hydrogel spacers in prostate cancer patients treated with pencil beam scanning (PBS) vs intensity modulated radiation therapy (IMRT).

METHODS: Three patients with rectal spacers were planned to a total dose of 79.2 Gy (RBE) in 44 fractions. Their CT images with 3 mm slice spacing were fused with MRI taken with the hydrogel for contouring of the prostate. Patients were originally planned with a nine-field 6 MV IMRT and then re-planned using PBS with two opposed lateral fields from a universal IBA nozzle. Two sets of PBS plans were performed: one with a uniform 5 mm anterior-posterior PTV expansion to be consistent with the photon plan and one with a 2 mm posterior/3 mm elsewhere PTV expansion reflecting our clinical practice. The range uncertainty along the beam direction was taken into account in the PBS planning. All plans were normalized to the same PTV coverage. Additionally, to assess the effect of the spacers on PBS patients, 10 randomly selected PBS patients without spacer were extracted from our patient database and their DVH parameters were analyzed. For these 10 patients, the PTV coverage met or exceeded that of the IMRT plans.

RESULTS: The figure below summarizes the averaged DVHs for the rectum. For the data points without spacer, the standard errors are <2% and <4% for the rectum and bladder, respectively. At higher doses, the rectal dose from the IMRT plan with the spacer is identical to a typical PBS plan without a spacer. The introduction of the rectal spacer significantly reduces the dose that the rectum receives for PBS plans. These dosimetric differences may confer larger clinical differences in hypofractionated patients. The DVHs for AP expansions of 2-3 mm vs 5 mm in PBS plans did not yield a significantly different rectal DVH when spacer was used.



CONCLUSIONS: Hydrogel spacers can further reduce the dose to the rectum for PBS patients. IMRT patients with spacers have rectal DVHs comparable to PBS patients without spacers even at high doses. A larger cohort of patients is necessary to confirm these conclusions.