

AbstractID: 6683 Title: Dosimetric comparison of cone beam computed tomography based patient-specific margins vs. uniform margins for prostate IMRT treatments

Purpose:

To evaluate the dosimetric improvement of IMRT treatment plans generated with patient-specific margins compared to uniform margins for prostate cancer patients.

Methods and Materials:

For 13 prostate cancer patients who underwent IMRT treatment, daily cone-beam computed tomography (CBCT) scans were acquired during the first week, followed by weekly scans (total of 85 scans) for the remainder of the treatment. Both prostate and seminal vesicles were retrospectively segmented on all CBCTs. The patient-specific planning target volume (PTV_{PS}) was defined based on a composite volume of both prostate and seminal vesicles from the first four daily CBCTs and the planning CT. A 3-mm margin was added around the composite volume to obtain PTV_{PS}. As a comparison, we also generated a PTV in the planning CT with a uniform margin (PTV_{Uni}) of 10-mm in all directions, except 5-mm posteriorly, around the prostate and seminal vesicles. An IMRT plan for each PTV was generated for each patient. Evaluation plans based on each of weekly CBCT were generated to gauge the DVHs resulting from these IMRT plans to the patient volumes segmented on weekly CBCTs.

Results:

Evaluation plans generated with PTV_{PS} in place of PTV_{Uni} resulted in average improvements of 1.4% and 2.8% for V95 of prostate and seminal vesicles, respectively, and average reduction of 7.0% and 4.7% for V50 of bladder and rectum, respectively. Out of 85 weekly CBCT evaluation plans for each PTV, 7.1% of cases showed improvement for V95 of prostate with PTV_{Uni}, 40.0% for V95 of seminal vesicles, 28.2% for V50 of bladder and 29.4% for V50 of rectum.

Conclusions:

Patient-specific margins, designed using multiple scans, appear to provide little dosimetric benefit with respect to target coverage over a standard uniform margin formulation; sparing critical structures is improved to a greater degree.

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