AbstractID: 13267 Title: An adaptive strategy for simultaneous treatment of the prostate and pelvic lymph nodes

Purpose: Certain prostate cancer patients are treated with simultaneous irradiation of pelvic lymph nodes and the prostate gland. One common method to compensate for prostate motion is to shift the patient based on implanted prostate markers. However, the pelvic lymph nodes move little relative to the bony anatomy. In this study, we evaluate an adaptive strategy designed to ensure that radiation is delivered accurately to both the prostate and the pelvic lymph nodes.

Materials and Methods: Treatment plans devised using clinical planning CT data and structures were optimized to deliver 50 Gy to the expanded prostate and seminal vesicles and 45 Gy to the lymph nodes. We used megavoltage conebeam CT data acquired during treatment to create a model of daily anatomical variations. The treatment plan and structures were transferred to this new model. The prostate, seminal vesicles, bladder, and rectum structures were shifted according to the position of prostate markers. The lymph node volumes were transferred according to the bony anatomy. In total, four plans were prepared: 1) the original plan 2) original plan shifted to match prostate motion 3) aperture morphing to compensate for prostate motion, and 4) aperture morphing followed by segment weight optimization.

Results: When the isocenter is shifted to track the prostate, the prostate received the correct dose while lymph nodes were underdosed. In one example, we found that D-95% reduced to 3500 cGy. Aperture morphing alone was not sufficient to deliver the correct dose to both the lymph nodes and prostate. However, aperture morphing followed by segment weight optimization improved coverage of the nodes and prostate.

Conclusions: Our results demonstrate that aperture morphing combined with segment weight optimization is an adaptive strategy that can be used to compensate for the independent motions of the lymph nodes and prostate.

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