

AbstractID: 10333 Title: Dosimetric QA tests of an online replanning technique for prostate adaptive radiotherapy

Purpose: We have previously developed an online replanning technique to be completed within 8 minutes. In preparation for its clinical implementation, a comprehensive QA test was performed to ensure its dosimetric accuracy and operational efficiency.

Method and Materials: The newly developed online replanning technique based on fast aperture morphing and weight optimization has been integrated into a planning system (Prowess). Daily CTs acquired using a CT-on-Rails (Siemens) of 3 randomly selected fractions for each of 5 representative prostate cancer cases were used to generate 15 daily plans in total. An independent MU calculation tool (RadCalc) was used to verify the MU numbers. All daily plans were delivered and measured with a 2D diode array (MapCheck).

Results: The time required for the entire replanning process starting from loading daily CT to getting the daily plan ready for delivery were less than 8 minutes, comparable to the time of the current IGRT repositioning procedure. The average time required for generating contours of prostate, rectum and bladder, aperture morphing and weight optimization, plan review, and transferring into the delivery system were 3, 2, 1, and 0.5 minutes, respectively. The agreement between MU numbers from RadCalc and from the online replanning tool remained the same as for the original plans and was acceptable (within 5%). The QA passing rates (the agreements between the measured and calculated dose distributions) for daily plans were equivalent to those for the original plans and were acceptable (within 95%).

Conclusion:

This new online replanning technique is dosimetrically accurate and practically efficient. Since the daily adaptive plans are not drastically different from the original plan, a QA measurement may not be necessary. A clinical trial to test the feasibility and efficacy of this replanning technique for prostate cancer is being initiated.