

AbstractID: 13422 Title: Dosimetry benefits of online adaptive replanning for whole Breast Irradiation

Purpose: Interfraction breast shape change (deformation) can be substantial (e.g., large or pendulous breasts in supine position), which, in turn, can degrade dose uniformity in breast. This change cannot be fully corrected for by patient repositioning. We have previously developed an online adaptive replanning technique to address interfraction variations. This work aims to demonstrate that this online replanning scheme can effectively account for the daily variation including setup errors and anatomic changes in whole breast irradiation (WBI).

Method and Materials: Daily CT scans collected during IGRT for representative breast cancer patients treated in supine position using a CT-on-Rails (CTVision, Siemens) were analyzed. For each patient, a WBI IMRT plan with tangential 6MV beams was generated based on the planning CT using a planning system (Prowess Inc.). An adaptive plan was generated based on each daily CT using the system (RealART, Prowess Inc) with the online replanning algorithms implemented. For comparison, the plan (repositioning plan) with the patient repositioned based on the registration between the daily CT and the planning CT was reconstructed by copying the original plan over to the daily CT with shifts considered. A total of 20 adaptive plans and 20 repositioning plans were generated and compared.

Results: DVH comparison shows that the adaptive plans, which are similar to the original plans, are generally superior than the repositioning plan in term of target coverage and/or critical structure sparing. Repositioning plans suffer from reduced target coverage. For example, values of V45Gy (breast volume covered by 45 Gy) and V50Gy are reduced by 10% and 6% respectively, for repositioning plans, while no changes in these values for adaptive plans.

Conclusion:

Interfractional variations in whole breast irradiation cause dosimetry degradation which cannot be accounted for by patient repositioning, but can be corrected by the online adaptive replanning.