

Purpose:

To compare interfractional patient setup and anatomy variations and their dosimetric consequences between prone and supine positioning in partial breast irradiation (PBI).

Methods:

Daily CT data acquired for 10 breast cancer patients (5 prone and 5 supine) during IGRT PBI treatments were analyzed. The patients were clinically setup to skin marks. Daily pre-treatment CTs were acquired using CT-on-Rails (CTVision, Siemens). Each daily CT was registered with corresponding planning CT prior to treatment to obtain repositioning shifts based on lumpectomy cavity. Contours of breast, lumpectomy, PTV and critical structures on daily CTs were generated using an auto-segmentation tool (ABAS, CMS) based on deformable image registration. For each patient, original treatment plan was applied to the daily CT twice, once based on the setup isocenter (setup plan), and then on the IGRT repositioning isocenter (repositioning plan). Dosimetric variations were measured by a series of dose-volume parameters and compared for the two plans.

Results:

The variation of daily repositioning shifts for supine cohort was statistically significantly less than that for prone patients. The comparison of the daily setup plans shows that the variations in PTV D95 and D98 (dose received by 95% and 98% of PTV) are smaller for supine cohort and varies from 0.5-3% (opposed with 2-8% for prone). The repositioning plans show a reduction in variation for the PTV dose criteria for both cohorts; however the D95 reduction for prone patients is not statistically significant and is patient dependent. The impact of repositioning on OAR DVH is dependent on location of the lesion and is small.

Conclusions:

Larger variation in IGRT repositioning shifts and in DVH parameters in the setup plans indicate the challenge of daily reproducibility of prone setup. Improvement in the plan quality with repositioning suggests the need of IGRT to increase reproducibility of prone setup for PBI.