AbstractID: 10411 Title: Evaluation of Inter-Fractional Setup Errors and Dosimetric Implication in Partial Breast Irradiation (PBI) Using Cone-Beam CT

Purpose: The objective is to evaluate inter-fractional patient setup errors in partial breast irradiation (PBI) using cone beam CT and to investigate the dosimetric impact of uncorrected setup errors. **Method and Materials:** Images from patients receiving PBI were acquired by on-board CBCT following initial treatment setup. Manual registration was performed daily to match fiducial markers on acquired CBCT to the planning CT. Setup errors over 10 fractions for several patients were evaluated. The resultant couch offsets were analyzed to estimate setup errors when image guidance is not available. To assess the dosimetric impact of uncorrected setup error, patient setup offsets were simulated by shifting plan isocenter with increasing magnitude in treatment planning system. Dose distribution of tumor and critical organs were compared between re-calculated plans to the original plans. The same procedure was performed using the daily setup offsets of several patients to evaluate the dosimetric impact in actual cases. **Results:** Although initial setup errors were found to be relatively small (<5mm), large systematic and random setup errors were observed in one patient (lateral: 9±6mm, longitudinal: 4±3mm, vertical: 2±10mm). The treatment simulation indicated that CTV volume covered by prescribed dose was within 95% when offsets were less than 3mm in all directions and decreased rapidly with larger shifts (79% for 10 mm shifts). In clinical cases, CTV coverage was found to decrease from 98.2% to 86.8% and the percentage of lung volume irradiated by 20Gy (V_{20}) increased by nearly two folds for the case with large errors. When setup errors are within 5mm, no significant changes in dose coverage were noticed. **Conclusion:** Daily patient setup errors can cause significant dosimetric changes in targets and critical organs in PBI if they are not corrected. CBCT could be used to reduce the uncertainties in setup errors and hence reducing dosimetric error.