AbstractID: 5331 Title: Reduction of Set-up Error using Cone Beam-CT in Patients Undergoing Partial Breast Irradiation

Purpose:
Partial breast irradiation with multiple external beams requires accurate alignment of the target volume and treatment isocenter. On-board plannar kV/MV imaging can verify set-up based on boney landmarks. On-board cone beam CT (CBCT) may provide additional soft-tissue-based information to further improve set-up accuracy. In this study, we assess the utility of CBCT in patients receiving partial breast radiation therapy, who have been aligned with on-board plannar kV/MV imaging.

Method and Materials:
Patients undergoing partial breast irradiation were imaged using an on-board-imager attached to the gantry of a Varian 21EX machine. Each patient was aligned to skin marks in the treatment position. Orthogonal kV images were acquired and registered to digitally reconstructed radiographs from the planning CT. Subsequently, a CBCT image data set was acquired and compared to the planning CT using both boney anatomy and soft tissue information which yielded estimations of residual setup error.

Results:
10 patients were studied under an IRB protocol. Each patient had an average acquisition of 9 pre-RT CBCT images. After 2D kV image registration based on boney anatomy, the average soft tissue residual error, based on the CBCT vs. planning CT, was 4, 2, and 3 mm in the Ant/Post, Sup/Inf, and Rt/Lt directions respectively. The ranges were 0-15, 0-9, and 0-7 mm, respectively. In one case, 30% of the planning tumor volume (PTV) would have been outside of the therapeutic isodose volume based on the pre-RT CBCT images.

Conclusion:
CBCT is a practical tool for image registration while visualizing the soft tissue of the tumor bed. It provides additional anatomic information and soft-tissue detail beyond that provided by planar radiographs. Such increased accuracy can significantly improve dosimetric coverage of the planning target volume.

Conflict of Interest (only if applicable):
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