AbstractID: 7685 Title: 3D Interfraction Position Verification for Patients Undergoing Partial Breast Irradiation: Comparing Digital Tomosynthesis to Cone-beam CT

Purpose: This clinical study evaluates digital tomosynthesis (DTS) technology for daily imaging guidance for partial breast irradiation (PBI) and compares its positioning accuracy to the 3D CBCT technique. Compared to CBCT, DTS offers lower imaging dose and the geometrical flexibility that particularly suits PBI.

Methods and Material: Ten patients undergoing PBI were imaged using an on-board-imager mounted on a Varian 21EX linear accelerator. Following the initials setup using skin markers and 2D KV/MV radiographs, a CBCT scan was acquired to provide 3D positioning guidance. A subset of the CBCT projections were used to reconstruct a stack of DTS image slices using the Feldkamp filtered back-projection algorithm. To optimize soft tissue contrast, the DTS images were reconstructed for the 45-degree oblique view along which the tumor bed, breast tissues, bones, and lung were well separated. Coronal and sagittal DTS views were also reconstructed for comparison. The inter-fraction position deviations between the 1st fraction and each of the subsequent fractions were measured by coronal-DTS, sagittal-DTS, oblique-DTS and CBCT as four independent technologies. Differences between these technologies and their clinical impact were evaluated. The evaluator was well trained for DTS technology.

Results: Eighty-five imaging datasets were obtained from 10 patients. Surgical clips (when present) were visible in all three DTS views. The tumor bed had the best contrast in the oblique-DTS. One-dimensional positioning differences between DTS (averaged over 3 DTS views) and CBCT were ~0.1 cm when surgical clips were used in the registration and ~0.2 cm when the tumor bed were used in the registration.

Conclusion: DTS is equivalent to CBDT as a 3D imaging technique for daily patient positioning of PBI but with less mechanical constraints and imaging dose.

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