AbstractID: 3929 Title: Image-Guided Process for 4D Lung Stereotactic Body Radiation Therapy

Purpose: To present the image-guided process used clinically at Princess Margaret Hospital for stereotactic body radiation therapy (SBRT) of small lung lesions. Respiration correlated cone-beam computed tomography (CBCT) was also investigated retrospectively to assess inter-fraction and intra-fraction target motion on the treatment unit.

Method and Materials: Five patients with inoperable early stage non-small cell lung carcinoma were treated using image-guided SBRT. For each patient, tumor motion was assessed initially using fluoroscopy on a conventional simulator to determine the requirement for abdominal compression to limit tumor excursion. The planning computed tomography (CT) session involved both helical and four-dimensional CT (4DCT) with compression applied as indicated by fluoroscopy. For SBRT, image guidance was achieved using a kV x-ray tube and amorphous silicon flat-panel detector mounted to the gantry drum of a linear accelerator (Elekta Synergy). Respiration correlated CBCT was also investigated, whereby the kV projections acquired for localization are sorted based on an internal surrogate of the respiration cycle. These sorted projections were reconstructed retrospectively to provide volumetric datasets at different phases in the respiratory cycle.

Results: Respiration correlated CBCT image datasets were generated for one patient undergoing SBRT. For each treatment fraction, the lung lesion demonstrated excursions consistent with the excursion measured by 4DCT at the time of planning. The lesion was within the limits of the PTV as determined by 4DCT.

Conclusion: We have established an efficient and streamlined image-guided process that is in clinical use for SBRT of small lung lesions. A framework for on-line respiration correlated CBCT acquisition on the treatment unit is being investigated to allow target motion to be assessed for each treatment fraction.

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