AbstractID: 3465 Title: Treatment dose verification for image-guided stereotactic radiotherapy of lung cancer

Purposes: The purpose of this work is to retrospectively verify treatment dose delivered in patients treated with stereotactic radiotherapy (SRT) to the lung.

Materials & Methods: In this study, a stereotactic body localizer (SBL) system was used for lung cancer patient immobilization in the CT simulation and stereotactic treatment planning on a prospective dose escalation protocol for malignant lung tumors. Prior to each treatment, a localization CT san was obtained in the treatment room after the patient was immobilized in the SBL. The stereotactic coordinates of three pre-selected bony landmarks were recorded from the pre-treatment scan and compared with those of the planning scan. Couch shifts were made based on the bony-landmark displacements. Image fusion was performed between the simulation CT scan to each pre-treatment CT scan in order to obtain the same planning target volumes (PTVs) and critical structures. The same treatment plans were re-loaded onto each pre-treatment CT scan with their respective stereotactic coordinate system. The changes in dose distributions were assessed by dose-volume histograms of the PTV and normal structures for the old and new isocenter coordinates using the bony-landmark shifts. We compared D_{95}, D_{99}, and V_{95} for the PTV and GTV, and V_{20} and V_{30} for the ipsilateral lung.

Results: Our preliminary study for 6 patients with 20 dose reconstructions showed that the average D_{95}, D_{99}, and V_{95} of the PTVs are 95.9%, 93.6%, and 98.4% of the planned values before bony-landmark shifts. With the bony-landmark shifts, these values are all improved to 100% of the planned values. The average V_{20} and V_{30} are 7-8% higher than the planned values without bony-landmark shifts and recovered the planned values after the corrections.

Conclusions: With near real-time 3D image guidance for setup error correction, the delivered dose distribution can be ensured for SRT hypofractionated lung treatment.