

AbstractID: 4829 Title: Benefit of 3D image-guided stereotactic localization in the hypofractionated treatment of lung cancer

Purposes: To investigate the benefit of image-guided stereotactic localization for lung cancer patients treated with hypofractionated radiotherapy.

Materials & Methods: A stereotactic body localizer (SBL) was used for patient immobilization, image registration among multi-phase CT simulation, and image-guided stereotactic localization. The simulation scans consist of 3 sets of CT images taken during free breathing and 2 breath-holding scans (at maximum inhalation and exhalation). Target delineation was performed on all 3 sets of images and the combination of the targets forms a composite gross-target volume (GTV). Treatment planning was performed on the planning-target volume (PTV) using 3 mm margin to account for the presumed reliability of the CT localization. Prior to each treatment, a localization CT scan using a CT-on-rails was obtained. Couch shifts were made based on the changes of the stereotactic coordinates of three pre-selected bony landmarks. In this retrospective treatment dose verification, we performed image fusion between the simulation CT scan and each pre-treatment CT scan to obtain the same target and critical structure information. 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 the critical structures before and after isocenter corrections which were prompted by image guided stereotactic localization. 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 retrospective study for 10 patients with 40 dose reconstructions showed that the average D_{95} , D_{99} , and V_{95} of the PTVs are 92.1%, 88.1%, and 95.8% of the planned values before isocenter corrections. With the corrections, these values are all improved to 100% of the planned values.

Conclusions: 3D image guidance is crucial for stereotactic radiotherapy of lung tumors when small margins are used.