

AbstractID: 6930 Title: An analysis of cone-beam CT for determining setup errors and designing treatment margins for non-small cell lung cancer patients

Purpose: KV cone-beam CT imaging (CBCT) was used to analyze setup errors when treating patients with non-small cell lung cancer (NSCLC). For patients where an off-line correction strategy was adopted, CBCT was also used to determine the patient specific planning target volume (PTV).

Method and Materials: Eighteen patients with NSCLC were treated with CBCT image-guided radiotherapy using an Elekta Synergy linac. 4D-CT imaging was used for treatment planning. Patients were scanned in the supine position during normal relaxed free-breathing and were immobilized with a wing-board. The internal target volume (ITV) was determined using the maximum-intensity-projection (MiP) CT data to account for organ motion. A 5-mm PTV margin was used to account for setup error. On-line setup correction was based on the daily CBCT imaging prior to treatment. The systematic and random errors were analyzed retrospectively. The results were then fit to our CBCT off-line correction strategy where a setup correction was made at the fifth treatment fraction to correct for the systematic error. The patient specific PTV margin was also analyzed.

Results: The systematic and random errors were 5.7 ± 3.2 mm, 4.2 ± 2.6 mm and 4.8 ± 3.1 mm for anterior-posterior (AP), medial-lateral (ML) and superior-inferior (SI) directions respectively. The 3D displacement vectors were 4.1 mm \pm 3.1 mm (systematic \pm random). If the patients were treated with the off-line correction strategy, a patient specific PTV margin ranging from 7.0 to 17.4 mm would be needed.

Conclusions: The use of a 5 mm PTV margin on the ITV determined by MiP dataset combined with daily CBCT on-line correction is adequate to avoid geometric miss of the tumor for NSCLC patients. A larger patient specific PTV margin, ranging from 7.0 to 17.4 mm, would be needed if an off-line correction is used.