

AbstractID: 6671 Title: Uncertainties in Respiratory Gating for Lung Tumors

Purpose: The purpose of this work is to quantify the uncertainties in tumor location during respiratory-gated radiation delivery when using implanted fiducial-based setups and respiratory gating to deliver the treatment.

Method and Materials: A patient treated for non-small-cell lung cancer was set up daily based on a fiducial implanted in the tumor. The fiducial was visualized using AP and Lateral kilovoltage x-rays gated on end expiration. Audio prompting was used to ensure regular breathing. Following alignment, a second pair of gated images was acquired to verify the shift. The uncertainties in the gating system were quantified by the residual error in fiducial location after the initial shift. In addition, cine megavoltage images were acquired of an AP field during the gated treatment (6-10/sec) and the fiducial positions were measured to quantify uncertainties in position between successive respiratory gates.

Results: Gating uncertainties measured by the residual error of the patient shift were determined to be 1.4, 3.3, and 1.3 mm for the LR, SI, and AP directions, respectively. The variation each day in the fiducial position averaged over each respiratory gate was determined to be 1.0 and 2.2 mm in the LR and SI directions respectively. The variation in fiducial position in successive respiratory gates over the course of treatment was measured to be negligible in the LR direction and 1.8 mm in the SI direction.

Conclusion: The uncertainties in respiratory gating were 3 mm over the course of treatment and 2 mm measured each day on successive gates used to deliver the treatment. Although respiratory gating may reduce tumor motion, the uncertainties in tumor position during respiratory gating must be considered when the internal margin is being designed.