

AbstractID: 7229 Title: Evaluation of mid-treatment tumor motion for hypo-fractionated lung radiosurgery using Hi-Art TomoTherapy System

Purpose: To investigate the variation of the daily mid-treatment positioning setup of the helical TomoTherapy with MV-CT for hypofractionated lung radiosurgery cases utilizing BodyFix rigid immobilization.

Methods and Materials: 54 cases treated by a hypo-fractionated Image Guided-Intensity Modulated Radiosurgery technique and immobilized with the BodyFix double vacuum system were analyzed retrospectively to investigate the daily variation of mid-treatment motion, as measured daily by MV-CT scanning. Scans were performed prior to treatment as well as at mid-treatment. In the treated cases, a margin of 7-9mm around the CTV was utilized as a PTV. The BodyFix double vacuum system with a lung compression belt was used to minimize breathing motion and intra-fractional tumor motion. Patients were treated daily by two fractions (e.g., 12Gy/day=6Gy/fr×2fr immediately sequentially delivered after MV-CT guidance).

Results: For all cases, multiple MV-CT scans were performed immediately before treatment to reach optimal treatment position. After image registration and subsequent adjustment, treatment was delivered. A mid-treatment MV-CT scan was obtained immediately after the first-half treatment and then table adjustments were compared. Table adjustment for mid-treatment was longitudinal: $1.3\pm 0.7\text{mm}$ and vertical: $0.9\pm 0.5\text{mm}$. The lateral recorded adjustments of $0.1\pm 0.3\text{mm}$ could not be accurately determined as movements of $<2\text{mm}$ were often omitted. It is found that slow MV-CT scan results in a blurred target image essentially negating the effects of respiratory cycle. These results showed that the treatment margin of 7-9mm was adequate to cover the target as verified by mid-treatment scan and that the BodyFix immobilization system provided clinically acceptable tolerance for lung radiosurgery. There was no significant difference in couch adjustment between upper and mid/lower lobe tumor locations, which may result from the robust immobilization tool.

Conclusions: MV-CT guided lung radio-surgery using Hi-Art TomoTherapy and BodyFix double vacuum system was clinically acceptable by minimizing the variation of patient position during the treatment.