

AbstractID: 13770 Title: Impact of Breathing Irreproducibility on Dose Delivery for Phase and Amplitude Gating

Purpose: Gated radiation therapy (gRT) reduces the effect of organ motion during treatment. Once internal margin due to residual motion is determined by four-dimensional computer tomography, it is used throughout entire treatments. However, patient's breathing is not completely reproducible during treatments, so dose distribution within internal target volume (ITV) can change from planned distribution. Therefore, we aim at evaluating effect of breathing changes on dose delivery of gRT. **Methods:** Each of nineteen patients with lung cancer was given five respiratory sessions,* and each session included free-breathing (FB), audio-instruction (A), and audio-visual biofeedback (AV). We assumed that the first session generates breathing traces for ITV determination, and others traces for delivery determination. A computational model was developed for calculating delivered dose under motion for phase and amplitude gating: dose at virtual detectors was expressed as a function of phases and positions. The doses in clinical target volume and normal tissue within ITV were evaluated using the volume receiving >90% of the prescription dose (V_{90}). **Results:** As we used a maximum extent of residual motion from the first session, CTV coverage did not show visible change during treatments. However, increases of 21.6% (range: -49.00% ~ 211.61%) and 2.51% (-45.65% ~ 45.27%) in V_{90} of normal tissue in ITV were observed for phase and amplitude gating, respectively. Phase gating showed that V_{90} of FB was higher than that of AV (FB: 27.23% and AV: 16.28%), while amplitude gating did not show notable differences. The amplitude gating saved more normal tissue than phase gating overall and particularly for FB. Use of maximum residual motion in ITV over the entire trace may not be possible, and CTV coverage is questionable. **Conclusion:** This study quantified dose delivery for gRT. *We thank R. George for providing data. In part supported by Nuclear R&D project from MEST, Korea