AbstractID: 9052 Title: Multiple Gating for Lung Stereotactic Body Radiotherapy Treatment

Purpose: An inherent problem in treatment of lung cancers with **stereotactic body radiotherapy (**SBRT) is target motion. Multiple-phase-based gating refers to treating the target at two or more phase windows with plans optimized for each window individually. It closely approximates the four-dimensional (4D) tracking technique when large number of gating windows is used. Compared to conventional single gating window technique, multiple-phase-based gating can improve the normal tissue sparing by taking advantage of the location change of the target. In addition, the duty cycle may be further improved. Compared to 4D tracking, the dose conformity of the multiple-gating technique may be inferior. However, its implementation may be more robust because of the allowance of residual error inside each gating window. In this study, we evaluate the dose performances for different techniques including static, single gated, dynamic 4D tracking, and two-window-gated SBRT plans.

Methods and Materials: A motion phantom was scanned with 4DCT and planned using the above techniques. The motion was 1D sinusoidal with amplitude of 1cm. For any optimized plan, 95% of the PTV was covered by the prescription dose of 60Gy. Film dosimetry was performed to compare the doses delivered in each plans. The above techniques were also compared for a lung patient who was undergoing SBRT treatment, prescribed to 60Gy in 3 fractions.

Results: Both the phantom and the patient studies showed similar results. If normalized to the static plan, the V_{20}'s were decreased by 56%,22%,16%, and the maximum doses in "lung" were changed to 102%,58%,45%, for single window gating, two-window gating, and 4D tracking, respectively.

Conclusion: Multiple-gating technique has significant improvement in lung dose sparing compared with static or single-gating techniques. Its difference from 4D plan is relatively small. The dose performance also highly depends on the size of tumor and the extent of target motion.