

AbstractID: 10599 Title: Margins for Hypofractionated Lung SBRT using CyberKnife Synchrony

Purpose: Real time tumor tracking can be performed using the Synchrony respiratory tracking (CyberKnife, Accuray). This study evaluates the range of target correction margins required for treatment of patients with lung tumors using this system.

Method and Materials: In this study, twenty-eight lung patients treated using Synchrony were selected. The moving average of the correction margin (CM), i.e., the difference between the predicted tumor positions versus on-line x-ray measured tumor positions, was extracted for each fraction as well as the entire course of the treatment for each patient. The population-based CM was then derived using the *modified* van Herk margin formula taking into account the hypofractionated regimen. This *modified* margin recipe also incorporated the situations of small number of patients, $N < 30$.

Results: For tumors of different locations, CMs for upper-lobe tumor margins (90% confidence level) were 0.6mm (AP), 0.7mm (RL), and 0.6mm (SI); CMs for lower-lobe tumors were 2.7 mm (AP), 2.6mm (RL), and 1.3mm (SI); CMs for hilar tumors were 1.4mm (AP), 1.3mm (RL), and 1.3mm (SI); CMs for mediastinum tumors were 1.7mm (AP), 1.2mm (RL), and 0.8mm (SI), respectively. Statistical significance on these value differences was found between the upper and the lower lobe group using student t-test ($p < 0.01$). The uncorrected tumor margins were 4.3mm (AP), 4.2mm (RL) and 8.7mm (SI) for upper-lobe tumors; 9.3mm (AP), 8.7mm (RL) and 9.8mm (SI) for lower-lobe tumors; 8.0mm (AP), 7.4mm (RL) and 14.1mm (SI) for hilar tumors; 8.8mm (AP), 7.4mm (RL) and 7.6mm (SI) for mediastinum tumors, respectively.

Conclusions: Based on the tumor location and the range of correction margins for real time respiratory tracking using Synchrony, the addition of a target margin of 1 to 3 mm in the AP, RL and SI directions for lung tumors would be adequate throughout the course of the treatment.