AbstractID: 3291 Title: Dose Escalation Resulting from Reduced Margins used to Generate the Planning Target Volume

Purpose:
Decreasing margins that account for setup uncertainty and respiratory-induced tumor motion can potentially result in improved treatment of lung cancer. The present work was designed to examine the dosimetric impact of reducing the margins used to generate the planning target volume (PTV).

M**ethods and Materials:**
Eighteen patients treated for non-small cell lung cancer were selected. Treatment plans were generated based on two sets of CTVs. One obtained while free-breathing explicitly accounted for respiratory-induced tumor motion, while the other acquired at end-expiration or inspiration simulated treatment under breath-hold. Margins used to generate the PTV were uniformly reduced in 2-mm increments from the clinically used 7-mm margins while escalating dose to the CTV. In the first part of the study, the dose to the CTV was escalated as long as normal tissue toxicity levels did not exceed that of the treatment plan actually used. In the second part, dose to the CTV was escalated until structures received the maximum dose-volume constraints allowed in our clinic.

Results:
Preliminary results showed that reducing the margin used to expand the breath-hold CTV from 7 to 3-mm allowed an increase of slightly higher than 10% of the prescription dose to be delivered to the tumor without exceeding normal tissue toxicity levels. When explicitly accounting for respiratory motion, a 1-mm margin was needed to observe statistically significant increases in dose to the CTV. By increasing the dose until critical structures received the maximum permissible dose, dose escalation of over 25% was observed using a 5-mm margin to generate the CTV. Statistically significant increases in dose were only slightly higher using a 3-mm uniform CTV expansion to generate the PTV.

Conclusions
As a result of this study, we have observed that increased doses can be delivered to the tumor by reducing margins used to generate the PTV.