AbstractID: 9373 Title: Impact of gating on dose escalation in lung cancer patients

Purpose: To investigate the potential impact of gating on treatment planning for lung tumors by evaluating the escalated dose achievable using 3D conformal radiation therapy (3D CRT) on gated tumors. **Method and Materials:** Twelve lung patients were contoured for gated and non-gated treatments by keeping using comparable toxicity of normal tissue as dose constraints, and 3D CRT plan was done on targets so that 100% of dose covered 95% of the target volume. The Linear-quadratic tumor control probability (TCP) model was used to determine the impact of dose escalation on local tumor control. Normal tissue complication probability (NTCP) was calculated using the Lyman-Kutcher-Burman model. **Results:** Three out of twelve patients exhibited significant differences between gated and non-gated ITV volumes with tumor motion >1cm between the respiratory phases, in both the superior and inferior tumor margins. For three of the 12 patients no dose change was found between gated and non-gated plans. One patient showed a dose decrease in gated case, due to nonlinearity of the tumor motion with respect to the breathing phase, i.e., tumor in 30% phase may move closer to an OAR than the tumor at 0% or 50% phase. **Conclusion:** Gating in radiotherapy treatment planning allows reduction in tumor margin, and clinically significant dose escalation up to 12% was found, while staying within clinically acceptable toxicity criteria. Deformation of the tumor becomes highly important in dose escalation, when the target is deformed in a way that alters the proximity of the tumor to an OAR. Tumors in the middle and lower portion of the left lung and mediastinal tumors could benefit, resulting in dose escalation. NTCP increased with mean lung dose for the lung (total lung-PTV) and TCP increased with modal dose value up to 80 Gy, above which TCP was unity.