AbstractID: 10991 Title: Dosimetric Impact of Five Tumor Delineation Strategies in Stereotactic Body Radiation Therapy for Lung Cancer

Purpose: The goal of this study was to examine the dosimetric impact of five different tumor delineation strategies in stereotactic body radiation therapy (SBRT) for lung cancer patients.

Methods and Materials: Seven patients who had previously undergone SBRT for lung cancer were retrospectively investigated. For each patient, a free breathing (FB) CT and a 4DCT were acquired. Based on the 4DCT scans, three post-processing CT images were reconstructed: maximum intensity projection (MIP), average intensity projection (AIP), and slow-CT (SCT) images. The gross target volumes (GTVs) were delineated on the following CT image data sets: GTV_{FB} on FB CT, $GTV_{0\%}$, $GTV_{10\%}$, …, $GTV_{90\%}$ on 4DCT, GTV_{MIP} on MIP CT, GTV_{AIP} on AIP CT, and GTV_{SCT} on SCT. The GTVs delineated on the 4DCT were combined to create the internal target volume (ITV). Five SBRT treatment plans were created on the FB CT image based on the tumor delineated above: GTV_{FB}, ITV, GTV_{MIP}, GTV_{AIP}, and GTV_{SCT}. For each plan, the 4D dose was calculated using deformable-image registration.

Results: On average the tumor D100 (minimum dose received by 100% of the tumor) of the ITV and GTV_{MIP} based plans is 3.0±4.0Gy (p=0.09) and 0.9±4.5Gy (p=0.61) respectively above that of the GTV_{FB} based plan. While the tumor D100 of the GTV_{AIP} and GTV_{SCT} based plans is 2.8±6.0Gy (p=0.26) and 0.8±4.1Gy (p=0.61) below that of the GTV_{FB} based plan respectively. Compared with the GTV_{FB} based plan, total lung V20 of the ITV based plan is 0.4±1.0% (p=0.36) absolute higher, while that of the GTV_{MIP}, GTV_{AIP}, and GTV_{SCT} based plans is 0.5±0.7% (p=0.09), 0.4±0.7% (p=0.17), and 0.2±0.5% (p=0.44) absolutely lower respectively.

Conclusions: All plans can deliver equally well dose coverage to the tumor. The difference in lung dose among the five plans is also significantly small.