

AbstractID: 10959 Title: The Impact of Attenuation and Scatter Correction on the SPECT Guided Radiation Therapy for Lung Cancer Patients: Comparison of SPECT Weighted Mean Dose and Functional Lung Segmentation

**Purpose:** To investigate the impact of different types of image reconstruction and attenuation/scatter (A/S) correction on the calculation of dosimetric indices proposed to be used for Single Photon Emission Computed Tomography (SPECT) guided dose escalation in lung cancer patients.

**Methods and Materials:** SPECT lung perfusion scans were obtained for nine lung cancer patients using  $^{99m}\text{Tc}$ -macroaggregated albumin. Four image sets were reconstructed from each scan: one using a vendor provided ordered subsets expectation maximization (OSEM) algorithm, two quantitative SPECT reconstructions using OSEM methods with different types of A/S corrections and the fourth an OSEM reconstruction without any A/S correction. SPECT weighted mean dose (SWMD), dose function histogram, and functional lung volume have been calculated from dose distributions and regional perfusion maps. To investigate the dependence of SWMDs on gantry angle, twelve equally spaced co-planar open field radiation beams delivering the same MU were centered on the PTV. Three field sizes, 5x5, 7.5x7.5 and 10x10cm<sup>2</sup> were considered. SWMDs were calculated for each field and reconstruction. Functional lung volumes were segmented in each reconstruction using 10, 20, ..., 90% of maximum SPECT uptake as a threshold.

**Results:** SWMDs calculated from reconstructions without A/S correction showed more than 5% average difference compared to those with corrections. With A/S corrections, more consistent SWMDs were found in all the three OSEM reconstructions (average difference ~2%). However, a large variation was observed between segmented functional lung volumes and the V20 of these volumes in all four reconstructions. The difference between the volumes reached over 50% regardless of whether A/S correction was applied in the reconstruction.

**Conclusion:** Functional volume segmentation is sensitive to the type of A/S correction. In contrast, SPECT weighted mean dose calculation produces more consistent results and appears to be a more robust choice for clinical outcome analysis and SPECT guided treatment planning.