

AbstractID: 7466 Title: Impact of Anatomical Changes on Dose Distributions During Three-dimensional Radiotherapy (3D-CRT) of Lung Cancer: Preliminary Study Using Multiple 4-DCT

**Purpose:** To investigate the impact of anatomical changes on target coverage and dose to normal tissues during radiotherapy for lung cancer using repeat four-dimensional computed tomography (4-DCT) imaging.

**Methods and materials:** Four patients with approximately 5-10 (average: 8) 4-DCT image data sets acquired weekly during treatment were used for this study. Treatment portals were based on planning tumor volumes (PTV) from the initial data set. The beam arrangements from the initial data sets were transferred onto the 4-DCT data sets for the subsequent treatment weeks and the dose distributions recalculated. Changes in the dose distributions were evaluated by dose-volume histograms (DVH) for the internal target volumes (ITV) as well as for normal tissues including total lung, heart and spinal cord.

**Results:** The overall average change in the percentage of volume of PTV and ITV covered by the 95% isodose (V95) between initial and during treatment was  $-5.2 \pm 8.1\%$  and  $-1.1 \pm 1.3\%$ , respectively. The overall average change in the dose to 95% of the PTV and ITV (D95) between initial and during treatment was  $-6.7 \pm 10.1\text{Gy}$  and  $-0.9 \pm 1.3\text{Gy}$ , respectively. Initial normal tissues volumes were comparable to the weekly datasets. Variation between initial vs. mean weekly percent total lung volume exceeding 20Gy (V20), mean total lung doses, and cord maximum doses were  $-1.4\% \pm 1.8\%$ ,  $-0.9\text{Gy} \pm 1.3\text{Gy}$  and  $6.1\text{Gy} \pm 7.1\text{Gy}$ , respectively.

**Conclusions:** Analysis of serial respiration-correlated CT scans provided useful information on dosimetric consequences of anatomical changes during treatment. Variation in target and normal tissue volumes were found to be small in average. However, changes were mainly observed in patients with mobile lower lobe lesions; therefore, effort to include image-guidance based setup or imaging during the course of treatment, should be considered.