

AbstractID: 13205 Title: Selection of CT image sets for treatment planning in stereotactic body radiation therapy of lung cancer

Purpose: This study investigated the impact on tumor dose coverage of treatment plans performed on various CT image sets in stereotactic body radiation therapy (SBRT) of lung cancer.

Methods and Materials: Five patients underwent SBRT for lung cancers were retrospectively investigated. For each patient, a free breathing (FB) CT and a four-dimensional (4D) CT were acquired. Based on the 4DCT scans, two post-processing CT images were reconstructed: average intensity projection CT (AIP) and a low pitch, slow-scan CT (SCT). The gross target volumes (GTVs) were delineated on the 4DCT images and combined to create the internal target volume (ITV). The planning target volume (PTV) was created by adding a 5 mm margin to the ITV. Treatment plans were performed on the FB CT, AIP CT, and SCT. Plan quality was evaluated by calculating and comparing the 4D dose for each plan using deformable-image registration.

Results: No matter which CT image sets were used in treatment planning, lung tumors always receive at least the prescribed dose. The average difference in tumor D100 (minimum dose received by 100% of the tumor) is 0.28 ± 0.61 Gy ($p=0.363$) between the plans performed on AIP CT and those on FB CT, 0.62 ± 1.35 Gy ($p=0.361$) between the plans performed on AIP CT and those on SCT, and 0.34 ± 0.77 Gy ($p=0.379$) between the plans performed on FB CT and those on SCT. As for the mean lung dose, the average difference is -0.07 ± 0.15 Gy ($p=0.390$), 0.07 ± 0.11 Gy ($p=0.221$), and 0.14 ± 0.15 Gy ($p=0.107$) respectively. For the total lung V20, the average difference is $-0.19 \pm 0.26\%$ ($p=0.186$), $0.13 \pm 0.25\%$ ($p=0.321$), and $0.31 \pm 0.27\%$ ($p=0.06$) respectively.

Conclusions: The differences in tumor and lung dose coverage for treatment plans performed on AIP CT, FB CT and SCT are indistinguishable. Those three CT data sets are equally well in term of dose coverage for treatment planning in lung SBRT.