AbstractID: 3983 Title: Effects of Patient Positions on PET Tumor Volume Assessment in Lung Cancer

Purpose: The purpose of this study is to investigate the effects of different patient positions on the PET and CT image registration, and to delineate more accurate PET metabolic tumor volumes (MTVs) using a deformable image registration in lung cancer. When PET and CT systems are used as stand alone modalities, the patient arm positions are usually different. We used a deformable image registration method to fuse PET and CT images with different patient positions.

Method and Materials: PET and CT images were acquired for 10 lung cancer patients. Both arms were placed at sides for PET imaging, but arms were up for CT imaging. The images were registered using an iterative non-rigid algorithm (REVEAL-MVS) based on voxel intensities. The displacements after the image registration were measured in the lung boundaries with axial and coronal images. The MTV and its mean standardized uptake value (SUV) in the PET images were measured before and after the non-rigid image registration.

Results: The displacements in the lung boundaries and diaphragm ranged from 1.85 to 3.89 cm for coronal images and from 1.57 to 2.42 cm for axial images. In 5 out of 10 cases the PET-MTV became greater and the mean SUV became smaller after the non-rigid image registration. The PET MTVs before and after the deformable image registration resulted in the volume differences of -1.8 cm^3 to +29.3 cm^3 and in the percent difference of –25% to +41%.

Conclusion: The different patient positions (arms-down for PET; arms-up for CT) in stand alone PET and CT systems yielded different PET tumor volume, extent and location. The non-rigid image registration should be used to obtain more accurate PET MTV and its location. The PET MTV using a deformable registration method may be utilized for CT-based radiation treatment planning in lung cancer.