AbstractID: 7216 Title: 4DCT-based Study of Tumor and Lung Kinematics during Respiratory Cycle

Purpose:
To evaluate the intra-fractional correlation of lung tumors and lungs motion induced by respiration.

Method and Materials:
Ten 4DCT scans acquired for treatment planning were used. Three patients had also a second scan in the middle of the treatment (after 4-5 weeks). All targets were in lower lobe of the lungs. GTVs for all phases were manually contoured and CTVs generated. ALl geometrical data were computed from DICOM-RT files. The lung volumes, their aeration, the motion tracks of lungs and CTV centroids along the cranio-caudal, anterior-posterior and lateral directions were determined for ten breathing phases obtained with 4DCT scan. The lung mechanics as demonstrated by the their ventilation map were evaluated from CT scans. The Pearson correlation coefficients between the lungs and CTV centroids for motion tracks along the axes of each patient were determined.

Results:
The volume of the CTVs ranged from 30 to 140cc (median=72cc). The motion of targets centroids along the C-C direction ranged from 1 to 3.5cm (median=1.6cm; for AP and RL median=0.3cm). The lungs and CTV motion along C-C direction exhibited high correlation (two cases in [0.7, 0.8]; rest>0.8). There are no correlation present for other directions. The examined CTVs did not exhibit any significant deformation during respiration. They were not attached to any immobile anatomical structure. The lung aeration pattern and target motion along the lungs cranio-caudal direction appear reproducible for three cases with two 4DCT scans. The changes in target volume did not affect the motion correlation.

Conclusion:
Lung kinematics appear to control tumor motion along the cranio-caudal direction for targets fully embedded in inferior part of the lungs. Assuming correspondence between lung function and regional aeration one can potentially use this information in treatment planning to spare these regions.

Conflict of Interest : none