AbstractID: 13493 Title: Respiratory phase effect on tumor shrinkage analysis

Purpose: Despite recent advances in image-guided techniques, radiation treatment outcomes of lung cancer patients remains relatively poor. One of the main challenges is the change in tumor position due to breathing motion, which may lead to inaccurate tumor volume estimates. We are investigating the possibility of differences in measured tumor volumes at different breathing phases. Accurate quantification of these volume differences and identification of an "ideal" respiratory phase for volume measurement would likely improve prediction of tumor response. **Methods and Materials:** We evaluated the shrinking tumor volume at four specific respiratory phases for 7 NSCLC patients. The corresponding 3D-CT image for a specific respiratory phase was reconstructed from 4D-CT acquisition data. For each phase, the mid-treatment and end of treatment scans were fused to the treatment planning CT using rigid registration. Pre-treatment GTV and PTV contours were copied to the mid-treatment and end of treatment scans, and further used for tumor segmentation using a registration-assisted approach based on the level-set deformable algorithm. After segmentation, the tumor volume was calculated for the two time-points during the course of RT. The differences in measured tumor volumes for four respiratory phases (mid-inhalation (MI), end-of-inhalation (EI), mid-exhalation (ME), end-of-exhalation (EE)) at two time-points in treatment were investigated. **Results**: Our preliminary analysis show that tumor volume measurements can differ at different respiratory phases, however, effects on tumor shrinkage analysis is small. Relatively, it is noted that volumes reconstructed at EI and ME phases tend to underestimate the shrinkage effect while MI and EE tend to overestimate the shrinkage effect. **Conclusions:** Our preliminary results show differences in volume measurements at different respiratory phases. A larger patient population would be required to select the ideal respiratory phase to provide accurate tumor volume changes. This will be a step further towards better understanding of radiation treatment efficacy.