AbstractID: 9234 Title: A robust approach for estimating tumor volume change during radiotherapy of lung cancer.

Purpose: Radiotherapy treatment of lung cancer patients is complicated by changes in tumor position due to breathing and changes in size due to regression. Accurate quantification of these changes during the course of treatment would likely improve tumor response and reduce toxicity risks. We are investigating robust methods for tracking and estimating tumor volume changes between treatment fractions.

Method and Materials: We have developed a registration–assisted segmentation approach based on the level-set deformable model, in which pre-treatment contours are propagated and adapted to fractions times at selected respiratory phases. At any time-point during treatment, a reference respiratory phase is selected and corresponding 3D-CT volumes are reconstructed from 4D-CT acquisition data. Images are then globally aligned using an efficient registration algorithm. Pre-treatment planning contours are copied to selected time-points. In our tumor regression analysis, the GTV contour was used to initialize the level set algorithm in-place and the PTV contour was used to narrowband the region, thus improving the algorithm's convergence. The feasibility of the proposed approach was investigated on a set of patients with repeated 4D scans acquired at three time-intervals.

Results: Our preliminary analysis indicates that the proposed approach can properly capture the boundary of the shrinking tumor region or split regions due to its topological adaptation ability. On an initial cohort of four NSCLC patients, the estimated tumor volume reductions ranged between 3-46% with a median of 8% by mid-treatment and between 26-51% with a median of 34% by the end of treatment

Conclusion: We have demonstrated a new approach for tracking tumor regression during the course of radiotherapy treatment of NSCLC patients based on a novel level-set segmentation algorithm. This approach provides us with a semi-automated tool for quantifying tumor shrinkage and allows accurate estimates of 'true' accumulated dose to the tumor.

Supported by CA85181 grant.