

AbstractID: 10803 Title: A novel workflow for SBRT image guidance using 4D CT method

Purpose: We presented a novel clinical workflow to determine inter-fractional image guidance shifts for SBRT treatment of lung using 4D CT scans, and validated this workflow in phantom studies.

Method and Materials: An ITV was first generated on the planning 4D CT image set and later used for treatment planning. The ITV and the 4D CT image sets on both the planning and treatment days were loaded into GE AW software. A manual registration was then performed. Using the measurement tool on AW, image guidance shifts were measured based on the same phase of the two CT image sets. Phantom studies were performed to simulate the entire SBRT process. The target was programmed to be shift for three scenarios: a) L/R and A/P shift; b) Longitudinal shift; and c) combination of L/R, A/P and longitudinal shift. All these phantom studies were repeated for two breathing traces: a sinusoidal and a real patient breathing trace.

Results: The phantom studies showed that the differences were within a CT voxel size for all three shifting scenarios between the programmed and the measured shifts using the 4D CT method, for both the sinusoidal and patient breathing traces. We also performed two other validation studies retrospectively for one patient. An average was calculated for the tumor centroid position on 10 phases using a segmentation program. The difference between the simulation day and the treatment day gave the image guidance shifts. The second method used the average intensity projection image on the AW software. The image guidance shifts determined by these two retrospective methods agreed within 2mm with our clinically-used method.

Conclusion: The workflow to determine image guidance shifts for SBRT treatment was validated by phantom studies, and it was further verified retrospectively by two independent methods for one patient with a lung tumor.