Purpose:To quantify the volume change of lung tumors during the course of therapeutic radiation as a function of initial volume and respiration induced motion.

Methods:Nine lung cancer patients were scanned on a Philips Big Bore Brilliance© CT scanner. They were subsequently rescanned after 4,000cGy of therapeutic lung tumor irradiation. Time dependence of the CT scans was obtained via placement of a bellows around the abdomen. Lung tumor lesions were contoured on inspiration (0% breathing phase) and exhalation (50% breathing phase) by a board certified radiation oncologist. Lesion volume and centroids were determined automatically via treatment planning software (Pinnacle© 9.0, ADAC Philips). External markers (BBs) were placed laterally and anterior to the approximate lesion location and formed a reference position.

Results:The reference position in general had less than one mm of motion. The average initial distance from lesion centroid to the diaphragm was 9.3 ± 5.3cm (SD, range 0.57–21.18cm). Upon rescan, the average distance was 9.1 ± 4.8cm. The average initial tumor centroid motion was 0.10 ± 0.08, 0.21 ± 0.17 and 0.70 ± 0.63cm for the left-right, anterior-posterior and superior-inferior directions respectively. Upon rescan, the same averages were 0.11 ± 0.08, 0.25 ± 0.16 and 0.65 ± 0.57cm. The average initial tumor volume was 27.6 ± 37.7cc (range 3.3 - 122.8cc). Upon rescan the average volume was 21.3 ± 30.9cc (range 0.5 – 97.1cc). For tumors whose volume was reduced by 40% or more (4 of 9, 44%), the ratio of superior-inferior motion after rescan to before showed less variation than for the lesions whose volume changed less: 1.07 ± 0.36 vs. 0.79 ± 0.76.

Conclusions:A trend was observed that suggests after 4,000cGy of therapeutic radiation, tumors with less volume change have less predictable motion change, than for tumors that experience a larger volume change.