

Purpose: Respiratory gating is widely used to reduce errors in target volume in planning CT and errors in treatment delivery. In selecting a patient-specific gating window width for gated treatment, the planner needs to correlate the magnitude of external motion signal to that of the 3D target motion in order to determine the magnitude of residual motion. We report our experience in determining patient-specific residual variation in routine clinics.

Material and Methods: Amplitude-gated CT scans were performed on 96 patients with lung cancer and 32 patients with liver cancer using Varian RPM gating system. Two gated CT scans with gating windows at the end of expiration and end of inspiration were acquired. The two gated CTs were registered to determine the two extreme positions of the target. The amplitude of the external motion signals between end of expiration and inspiration was correlated to these two extreme positions. The magnitude of residual external motion during CT beam-on time was converted to 3D target residual motion.

Results: In 96 lung cancer patients, significant target motions were found in inferior (84 patients, 3-18 mm, median 7), anterior (57 patients, 3-20 mm, median 5 mm), posterior (23 patients, 3-15 mm, median 6 mm), left (30 patients, 3-15 mm, median 5 mm), right (28 patients, 3-15 mm, median 5 mm) direction. In 32 liver cancer patients, significant target motion were found in inferior (32 patients, 5-20 mm, median 10), anterior (20 patients, 3-13 mm, median 7 mm), right (13 patients, 3-10 mm, median 7 mm) directions. Residual motion during CT beam-on time ranged 14-32% of the excursion. This information was used to determine gating window width for delivery and motion margin.

Conclusion: Intrafractional residual target motion is not negligible and can be routinely addressed with this method.