

AbstractID: 4988 Title: Breathing Phase Information Extraction Method from Non-Gated CT

Purpose: To evaluate feasibility and clinical usefulness of a new breathing phase extraction method from regular non-gated CT scans in order to minimize the uncertainty of the dose calculations due to the external and internal motion artifact, also known as breathing “ripple” effect.

Method and Materials: Non-gated CT is acquired as usual for 3-D patient geometry reconstruction in 3-D conformal and IMRT treatment planning. A sub-set of CT slices is then selected based on the timing correlation of the visible “ripple” effect and a new 3D image is made with interpolation. The image extracted with the new method is similar to the images acquired with 4-D CT. At least two breathing phases can be reliably reconstructed: inhale and exhale. Gated 4-D CT is also acquired at the same time at four gated phases. Comparison is then made for center of mass coordinates, tumor volume and displacement between extracted and acquired breathing phased images.

Results: CT scans from 7 radiosurgery lung and kidney patients were used in this study. The average differences for location and displacement did not exceed 2 mm in Left to Right and Anterior to Posterior directions. Superior-Inferior difference was up to 4 mm. Volume difference larger for the small tumors and went down when the tumor volume increased. Average volume difference was 9% with standard deviation of 14% for lung tumors with volume less than 10 cubic centimeters, and less than 8% and standard deviation of 6% for larger tumors.

Conclusion: The breathing phase extraction method produced results comparable to the gated CT acquisition. While it may not be precise enough for the radiosurgery treatments, it is a good tool for planning fractionated treatments aiding in tumor delineation, defining PTV and assessing dose corrections due to tumor motion.

Conflict of Interest (only if applicable):