

AbstractID: 3008 Title: Reduction of motion blurring artifact using respiratory gated CT: a quantitative evaluation

Purpose: To develop a technique for reducing respiratory motion blurring artifacts using respiratory-gated CT, and to quantitatively evaluate the artifact reduction.

Method and Materials: Similar to electrocardiogram (ECG) gated imaging for the heart, a synthetic sinogram was built from multiple scans intercepting a respiration gated window. A gated CT image was then reconstructed by the filtered back-projection algorithm. CT images of wedge phantoms moving at different speeds, and 13 patients were taken with synchronized respiratory motion measurement. The scanner was operated in ciné mode with 100 and 15 scans (0.5 s rotation) acquired consecutively at each couch position for phantoms and patients, respectively. Two error functions were fit to the CT profile across the air-phantom or lung-diaphragm boundaries for a quantitative evaluation of the blurring artifact.

Results: The blurring artifact was reduced significantly at the air-phantom boundaries in the gated image. The gated image of phantoms with a motion of 20 mm/s showed similar blurring artifacts as the non-gated image of phantoms with a motion of 10 mm/s. The blurring artifact had a linear relationship with both the speed and the tangent of the wedge angles. The blurring artifacts were also reduced at the lung-diaphragm boundaries for patients. Centers of the two fitted error functions provided a reliable measure of large blurring, and were found equivalent to 25% and 75% locations of the CT profile.

Conclusion: The respiratory gated CT imaging reduced the blurring artifacts for both moving phantoms and patients. This technique may be applied for other tomographic imaging modalities that require long imaging times with significant motion blurring artifacts, such as PET.

Keywords: Motion artifact, CT, Respiratory motion, Sinogram