Image quality of volume rendering of the bronchial tree: Kymogram-gated versus retrospectively ECG-gated and non-gated multi-row detector CT

Thomas Boehm, Hatem Alkadhi, Dirk-Alexander Sennst, Thomas Schertler, M Kachelriess, Willi Kalender, Borut Marincek & Simon Wildermuth

RATIONALE AND OBJECTIVE: To compare the image quality of three different heart-cycle-synchronized computed tomography (CT) reconstruction algorithms for volume-rendered (VR) 3D visualization of the bronchial tree. MATERIALS AND METHODS: Kymogram-gated, retrospectively ECG-gated, and non-ECG-gated reconstructions of the bronchial tree were performed from 4-detector-row CT data in 10 subjects. The raw data were reconstructed in 10 phases of the cardiac cycle using ECG-gated and kymogram-gated technique, respectively. For both reconstructions, the optimal artifact-free diastolic phase was determined. VR reconstructions of the bronchial tree were generated from these two data sets and from the non-gated data. Stairstep artifacts of the main bronchi, artifacts in the lung parenchyma, and the extent of bronchial tree visualization were rated by two blinded, independent readers. RESULTS: Kymogram-gated reconstruction showed stairstep artifacts in the main bronchi to the same extent as non-gated reconstruction, but less compared to ECG-gated reconstruction (P < .001). Artifacts in the lung parenchyma were similar with kymogram-gated and non-gated reconstruction, but less compared to ECG-gated reconstruction (P < 0.01). Kymogram-gated reconstruction showed no differences in visualization of segmental and subsegmental bronchi compared to ECG-gated reconstruction, but was inferior to the non-gated reconstruction (P < 0.05). CONCLUSION: Kymogram-gated reconstruction of CT data results in fewer artifacts when compared to the ECG-gated algorithm. Best visualization of the bronchial tree at a low artifact level is obtained with non-gated CT data. It remains therefore the method of choice for VR 3D data post-processing of the bronchial tree.