

Free-breathing CCTA using 320-detector CT: an initial experience

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PURPOSE: A hypothesis was established that high temporal resolution CT could acquire ECG-gated cardiac CT during quite respiration without significant deterioration of image quality. In this study, the feasibility of free-breathing coronary computed tomography angiography (CCTA) was evaluated in adults using 320-detector CT scanner.

MATERIALS AND METHODS: In 74 patients who underwent CCTA from September 2011 to December 2011, 37 CCTA examinations were performed during free-breathing, and the remaining 37 CCTA examinations were produced using the standard breath-holding method. The quality scores for 16 segments of all coronary arteries larger than 1 mm luminal diameter were analyzed and defined as: 1 (excellent), 2 (good), and 3 (poor). The signal to noise ratio (SNR), contrast to noise ratio (CNR), and effective radiation dose of each image were compared between the two methods.

RESULTS: No significant difference in demographic data was observed between the two subject groups. A total of 995 coronary artery segments were available for evaluation, and no significant differences were observed in subjective image quality between the free-breathing and breath-holding scan methods (1.02 ± 0.05 vs. 1.03 ± 0.05 , respectively; $p = 0.56$). The SNR and CNR were not significantly different between the two methods (SNR: 14.0 ± 2.9 vs. 13.8 ± 2.2 , respectively; CNR in left main coronary artery: 16.9 ± 3.2 vs. 16.6 ± 2.7 , respectively). The overall mean effective radiation dose revealed no significant difference between the two methods.

CONCLUSION: Free-breathing CCTA, using a 320-detector CT scanner showed no significant difference in image quality compared to the standard breath-holding CCTA. During the CCTA for patients with difficulty in holding their breath or with marked apnea-related heart rate variability, the free-breathing CCTA during a single heart beat can be an acceptable solution.