Title: Clinical and Fundamental Studies of Iterative Reconstruction Algorithms for the Evaluation of Thoracic...

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Clinical and Fundamental Studies of Iterative Reconstruction Algorithms for the Evaluation of Thoracic CT
（胸部領域 CT における逐次近似再構成法の有用性の臨床的および基礎的研究）

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Abstract of the Thesis

Background and Purpose: CT imaging of low-radiation doses with IR technique have some advantage for the evaluation of thoracic lesions, but has not been fully investigated. The purposes of our study were as follows: 1) to assess the value of the knowledge-based IMR algorithm on the qualitative- and quantitative image quality at cardiac CT, 2) to investigate the effects of the knowledge-based IMR algorithm on the qualitative- and quantitative image quality at low-dose chest CT.

Methods: 1) We enrolled 21 patients undergoing retrospective ECG-gated cardiac CT at 100 kVp. Images were reconstructed using the FBP, HIR, and IMR algorithms. All of the studies, objective and subjective image quality parameters were compared among the different CT images. 2) We enrolled 31 patients undergoing low-dose screening chest CT. Images were reconstructed using the filtered back projection (FBP), hybrid iterative reconstruction (HIR), and IMR algorithms.

Results: 1) There was no significant difference in the CT attenuation among the three reconstructions. The mean CT attenuation of the proximal coronary arteries was not significantly different. The image noise of the proximal coronary arteries was significantly lower with IMR (11.3 ± 2.8 HU) than FBP (51.9 ± 12.9 HU) and hybrid IR (23.2 ± 5.2 HU). The mean CNR of the proximal coronary arteries was 9.4 ± 2.4, 20.2 ± 4.7, and 41.8 ± 9.5 with FBP, hybrid IR and IMR, respectively; it was significantly higher with IMR. The best subjective image quality for coronary vessels was obtained with IMR (proximal vessels: FBP, 2.6 ± 0.5; hybrid IR, 3.4 ± 0.5; IMR, 3.8 ± 0.4; distal vessels: FBP, 2.3 ± 0.5; hybrid IR, 3.1 ± 0.5; IMR, 3.7 ± 0.5). IMR also yielded the best visualization for cardiac systems, i.e. myocardium and heart valves. 2) The mean estimated effective dose of CT scans was 1.0 ± 0.3 mSv. There was no significant difference in the CT attenuation among the 3 reconstructions. The mean image noise was significantly different among the 3 reconstructions (p < 0.01). The best subjective overall image quality for lung and mediastinum was obtained with IMR (p < 0.01).

Conclusions: Low-dose thoracic CT with Iterative Reconstruction technique method has potentials to provide noise-free image and reduction of radiation exposure, reduction of contrast agent volume, and resulting in improvement of diagnostic performance in lung and cardiac CT.