Performance of a New Iterative Reconstruction Algorithm for Cardiac Short-Time SPECT: Preliminary Results in an Anthropomorphic Cardiac Phantom Study

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Background: A new iterative reconstruction algorithms (WBR^{TM}) has been recently approved for cardiac SPECT. WBR™ improves image resolution by reducing noise and improving lesion identification. Few data exist on the comparison between conventional filtered back-projection (FBP) and WBR™.
Aim: The aim of this study was to compare the performance of FBP and this new algorithm in an anthropomorphic cardiac phantom.
Methods: An anthropomorphic phantom was acquired with a dual-head-@90° camera, equipped with a HR collimator. Two different activities of a solution of 99mTcO4- were used to fill the heart wall: 20.3 MBq (comparable to the activity usually obtained in clinical setting; standard dose, SD) and 10.1 MBq (half-dose, HD). An infarction was simulated in anterior, septal, posterior, and lateral region with a cold disk (3.92cm^3, 60° aperture) inserted in the cardiac wall. For each wall activity and the different lesions, 2 sets of acquisitions were recorded: at 20sec/frames (standard time, ST) and at 10sec/frame (half time, HT). Each SPECT was reconstructed with conventional FBP (Butterworth 0.4, 10) and WBR™; a circular ROI was drawn on the short-axis slice better displaying the lesion. An activity-vs.-angular position histogram (circumferential profile) was obtained and the FWHM was calculated for each lesion.
Results: The average FWHM of the simulated infarction in SD-HT (65.7°) and HD-ST (57.5°) WBR^{TM} SPECT were comparable to that of SD-ST FBP SPECT (65.3°). However, regional differences were observed.
Conclusions: The new reconstruction algorithm, applied to a cardiac SPECT acquisition, allows either for short time SPECT acquisitions or studies employing a reduced isotope activity. The former allows for an increased patient throughput and optimization of resources. The latter modality would also allow for a significant reduction in patients' as well as operators' radiation exposure.

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