Gated Myocardial Perfusion SPECT: Comparison of "Quarter-Time" WBR and "Full-Time" FBP Clinical Results.

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Background: In previous works we evaluated the Wide-Beam Reconstruction (WBR) method, which incorporates collimator resolution recovery and noise control, for half-acquisition-time cardiac scans. In comparison to full-time conventional FBP reconstruction, it was found that WBR provides superior image quality and has a potential to be applied for even lower statistical scans. In the current work we demonstrate that WBR allows quarter-time cardiac gated SPECT acquisition with the same or better diagnostic quality as full-time FBP.

Methods: The WBR method was optimized for quarter-time acquisition based upon anthropomorphic cardiac phantom data and a pilot group of 48 patients (pts). Then 134 pts were scanned routinely at rest (R) and stress (S) (9/32 mCi ^{99m}Tc-sestamibi), each immediately followed by the respective quarter-time scan. Full-time data have been reconstructed by FBP and OSEM. Quarter-time scans were reconstructed with the modified WBR algorithm. Protocol: 180-degree SPECT, 60-stops, full-time single-day rest (R) 25 second-per-stop (sps) and gated post-stress (S) (20sps), each followed by quarter-time R (6sps) and post-S (4 sps) gated SPECT respectively. In addition, half-time S&R data was simulated from the full-time scans, using statistical Poisson randomizing algorithm. We compared quarter-time WBR results to full time FBP, full-time OSEM and half-time WBR reconstruction. Blinded observers graded scan image quality (IQ) (1=poor to 5=excellent) based on myocardial uniformity, endocardial /epicardial edge definition, and background noise. Perfusion defects were scored using a 17-segment model. The EDV, ESV, and LVEF were calculated by three commercially available clinical software packages.

Results: For the 134 pts mean IQ for S quarter-time WBR was superior to full-time FBP (4.19$\pm$0.73 vs. 3.35$\pm$0.74) (p=3.07E-28). R IQ of quarter-time WBR for 6 sps were slightly better compared to R full-time FBP (3.51$\pm$0.93 vs. 3.13$\pm$0.66) (p=1.0E-7). Both R&S quarter-time WBR IQ was similar to full-time OSEM and half-time WBR. For the 30 pts with abnormal scans (SSS's >2 by OSEM) mean SSS's, SRS's, and SDS's were not significantly different with quarter-time WBR vs. full-time FBP (6.43 vs. 6.57), (5.87 vs. 5.5), (0.57 vs. 1.07) (p's NS). For the three clinical packages, there was a good correlation of LVEF, EDV, and ESV determined by WBR vs. full-time FBP. ESV's were generally higher with WBR, primarily due to better delineation of the valve plane at end-systole, whereas EDV's were similar. Thus, EF's were significantly lower with WBR.

Conclusions: **Q**uarter-time gated SPECT WBR processing provides IQ, defect characterization, and functional assessment that is better or equivalent to full-time FBP and OSEM.

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