

Quarter-Time Myocardial Perfusion SPECT using UltraSPECT's Wide Beam Reconstruction Method.

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Abstract:

Background: Wide beam reconstruction (WBR) is an iterative image reconstruction method incorporating resolution recovery and noise reduction without applying a post-processing filter. WBR has already been reported to allow half-time myocardial perfusion SPECT acquisition for both rest and post-stress (including gated) studies while preserving diagnostic quality, as compared to full-time SPECT reconstructed with filtered backprojection (FBP) with OSEM. In this research we postulated that with further improvements of the WBR algorithm even shorter acquisition times would be possible.

Methods: In a prior pilot study the half-time WBR algorithm was modified for “quarter-time” acquisitions based on anthropomorphic cardiac phantom data and a pilot group of 48 patients (pts). Pilot pts underwent 180-degree, 64-stop, full-time single-day rest (25 sec/stop) and stress (20 sec/stop) and then quarter-time either rest (6 sec/stop) (n=27 pts) or stress (4 sec/stop) (n=21pts) Tc-99m sestamibi SPECT using a 90°-angled dual-headed scintillation camera with high-resolution parallel-hole collimators.

For the current research, the same protocol was used to study 30 new, consecutive pts. The pts were imaged both at rest and post-stress utilizing three different methods: full-time FBP, full-time OSEM and quarter-time WBR, as modified based on the pilot study performed earlier. Blinded observers graded the summed stress and rest scans for quality (1=poor to 5=excellent) and evaluated reconstruction defect characteristics.

Results: For the 30 pts mean image quality for summed post-stress and rest full-time FBP were 3.43 and 3.17 respectively. Full-time OSEM grades were 4.10 and

3.73. Quarter-time WBR images received 4.10 and 3.33 for post-stress and rest respectively. Reconstruction defects and artifacts were noted in 5 full-time FBP, in 4 full-time OSEM images, and in 2 quarter-time WBR reconstructions.

Conclusions: Quarter-time WBR and full-time OSEM are superior in image quality to full-time FBP for both rest and post-stress studies. Quarter-time WBR summed post-stress image quality is equivalent to full-time OSEM, though WBR rest image quality is slightly poorer than full-time OSEM.