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Half-Dose Myocardial Perfusion SPECT with Wide Beam Reconstruction

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Abstract:

Background: Wide Beam Reconstruction (WBR) (UltraSPECT, Ltd) incorporates resolution recovery and noise modeling to cope with decreased SPECT counting statistics. Previously, comparing gated myocardial perfusion SPECT (MPI) with one-half the stress and rest acquisition times to full-time scans processed with ordered subset expectation maximum (OSEM), we reported equivalent/superior image quality and defect characterization with half-time WBR. Because WBR processing reconstructs half the usual SPECT counting statistics, we now postulate that similar image quality can be achieved with half the radiopharmaceutical dose and a full-time acquisition.

Methods: In 61 consecutive patients (pts) (28 men, 33 women; mean weight = 180 ± 33 lbs, chest circumference = 40 ± 4 in), rest and 8-frame gated post-stress MPI was performed following 5.7 ± 0.6 mCi and 17.6 ± 2.3 mCi Tc-99m sestamibi injections respectively (standard doses = 10 and 34 mCi). Image quality (1 = poor to 5 = excellent) was judged by myocardial count density and uniformity, endocardial edge definition, perfusion defect delineation, right ventricular visualization, and background noise. Results were compared to those from a gender- and body habitus-matched group of 156 pts from a previous report who underwent both "full-time" OSEM and "full-dose, half-time" WBR.

Results: Perfusion defects were present in 21/61 pts. Mean image quality for summed rest, stress, and stress gated MPI were:

	Full-time OSEM (n=156)	1/2-time WBR (n=156)	1/2-dose WBR (n=61)
Rest	3.6 ± 0.7	3.7 ± 0.8	3.9 ± 0.7
Stress	3.8 ± 0.7	4.0 ± 0.7	4.2 ± 0.5
Gated	4.0 ± 0.6	4.6 ± 0.5	4.8 ± 0.5

Half-time and half-dose WBR image quality were both superior to standard OSEM MPI (p 's ≤ 0.001). Half-dose WBR was not significantly different from half-time WBR.

Conclusions: A half-dose/full-time WBR protocol halves patient radiation exposure and yields MPI image quality equal to a full-dose/half-time WBR scan and slightly superior to a full-dose/full-time scan processed with OSEM. According to published estimates, the mean effective dose is ~6 mSv with the half-dose protocol vs. ~11 mSv with a standard full-dose protocol.

Author Disclosure Information: **G. DePuey**, UltraSPECT, Ltd., Modest, 2. Research Grant; Cardinal Health, Modest, 4. Speakers Bureau; UltraSPECT, Ltd., Modest, 7. Consultant/Advisory Board; **S. Bommireddipalli**, None.

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