

OSEM and WBR half-time gated myocardial perfusion SPECT: a comparison to filtered backprojection

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Objectives : Compared to filtered back projection (FBP), OSEM with resolution recovery (OSEM-RR) and wide beam reconstruction (WBR), which models noise in the reconstruction process, have been shown to maintain/improve myocardial perfusion SPECT quality, even with low count density half-time acquisitions. We postulated that their characteristics would be advantageous for gated SPECT, wherein each frame is only 1/8th the count density of the summed perfusion images.

Methods : An 8 mCi rest/32 mCi stress Tc^{99m} sestamibi protocol was used. 15-min FBP, and additional 7-min OSEM-RR and WBR post-stress 8-frame/cardiac cycle SPECT scans were acquired with 90°-angled dual-headed detectors equipped with high resolution collimators in 82 patients (48F,34M)(123-252 lbs). By visual analysis, gated image quality was graded: 1 (poor) – 4 (excellent). In 42 patients with perfusion defects regional LV wall motion (WM) was scored: 0 (normal) – 4 (dyskinesia) in a total of 50 vascular territories with defects. Post-stress EDV, ESV, and EF were calculated for each method.

Results :

Despite half-time acquisitions, compared to FBP, image quality and the severity of WM abnormalities increased marginally with OSEM-RR ($p=0.09$) but very significantly with WBR ($p=1.9 \times 10^{-21}$). However, although quantitative parameters correlated well with those determined by FBP (all EF r 's > 0.85), EFs were significantly lower ($p=0.0001$ for OSEM-RR, 3.4×10^{-14} for WBR), primarily due to a decrease in EDV with OSEM-RR ($p=7.3 \times 10^{-13}$) and an increase in ESV with WBR ($p=9.2 \times 10^{-5}$).

Conclusions : Half-time OSEM-RR and particularly WBR improve gated SPECT diagnostic quality compared to full-time FBP due to increased resolution and noise reduction. However, these attributes, which affect endocardial edge detection, result in a systematic offset in EDV, ESV, and EF.