WIDE BEAM RECONSTRUCTION METHOD FOR SHORTENING SCAN TIME OF GATED CARDIAC STRESS SPECT: PRELIMINARY EVALUATION

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Background: Myocardial perfusion SPECT studies have a scan time between 12 and 25 minutes, according to the guidelines of the ACC/AHA/ASNC, which often results in patient motion with image artifacts as well as throughput limitations. This study evaluates image quality and potential clinical benefit of a new gated stress myocardial perfusion SPECT protocol, with scan time reduced by one-half and the data reconstructed using the Wide Beam Reconstruction method (WBR™).

Methods: The WBR™ technology (UltraSPECT Ltd), based on an accurate modeling of the emission detection process, was designed to simultaneously suppress noise and improve image resolution. The WBR algorithm was optimized specifically for short gated cardiac stress perfusion scans without applying any post-filter. Several phantom studies were reconstructed using both WBR and FBP/OSEM: NEMA SPECT protocols, cold and hot sphere phantoms (6 spheres: 9.5 - 31.8 mm diameter), anthropomorphic torso phantom with a cold insert (2cm x 2cm x 1cm) simulating clinical conditions was scanned twice with full and half scan times. Relative activity concentration in the phantom, were 100%, 20%, 16% and 0% in liver, ventricle cavity, torso and insert, respectively. For each reconstruction method, the respective spatial resolution, coefficient of variation (CV) and contrast recovery (CR) were measured. Full scan time images were reconstructed for 26 patients (18 males) using filtered back projection. Half of the projections data were then discarded and the remaining data were reconstructed using WBR.

Results: Average FWHM following NEMA were 7.5 and 10.1 for WBR™ and FBP respectively. Cold spheres' CV was 3.8% for WBR™ and 4.9% for OSEM Average CR of the WBR™ was 42% higher than OSEM. WBR™ CR of the 2 smallest spheres was 40% higher than for OSEM. For the "hot" spheres, the superiority of WBR™ was even higher. For the torso phantom, the average CR for VLA and SA between normal and "cold" lesion was 68% for the WBR™ half-time and 51% for full-time FBP. VLA's CV was identical for both methods. The results of 26 patients demonstrated no clinical differences between the two types of protocols and reconstruction algorithms.

Conclusions: The WBR™ method demonstrates improved resolution, better uniformity and enhanced "cold" and "hot" lesion detectability over current reconstruction methods through phantom studies. This method appears to have clinical benefits by potentially allowing for reduction of stress SPECT scan time to 50% of the typical clinical values, without introducing artifacts.

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