IMAGE RECONSTRUCTION ADVANCES

Software improvements in image reconstruction have centered on the development of new proprietary algorithms that have evolved from the early work in iterative reconstruction techniques (maximum-likelihood expectation maximization[8, 9] and ordered-subsets expectation maximization),[10] which were developed to improve image contrast and reduce noise levels inherent in images with low counts reconstructed with filtered backprojection. These algorithms were extended to include depth-dependent and resolution recovery techniques developed to correct for losses in spatial resolution due to the line response function of the collimator.[11] The algorithms currently available simultaneously address both of the problems by modeling the instrumentation and imaging parameters used for a specific application to eliminate the effects of the line response function and suppressing noise in the image reconstruction process. The resolution recovery aspects of these algorithms can be emphasized to provide significant improvements in spatial resolution and image quality of SPECT sets, and the noise suppression aspects can be emphasized to permit decreased imaging times for SPECT acquisitions. The first software package to be made available commercially was introduced by UltraSPECT (Haifa, Israel) employed the Wide Beam Reconstruction (WBR) algorithm.[12-14] The Xpress.Cardiac product was developed using both resolution recovery and noise suppression techniques to reduce imaging times in routine cardiac SPECT by 50% while maintaining spatial resolution and image quality. Figure 17 demonstrates the capability of the WBR algorithm in a patient with a normal gated SPECT myocardial perfusion imaging (MPI) study. The conventional SPECT study (Figure 17*A*) was acquired in 10 minutes and reconstructed via filtered backprojection. The study in Figure 17*B* was acquired in 5 minutes and reconstructed via the WBR algorithm and demonstrated comparable diagnostic quality with improved contrast in comparison to the conventional SPECT acquisition and reconstruction…

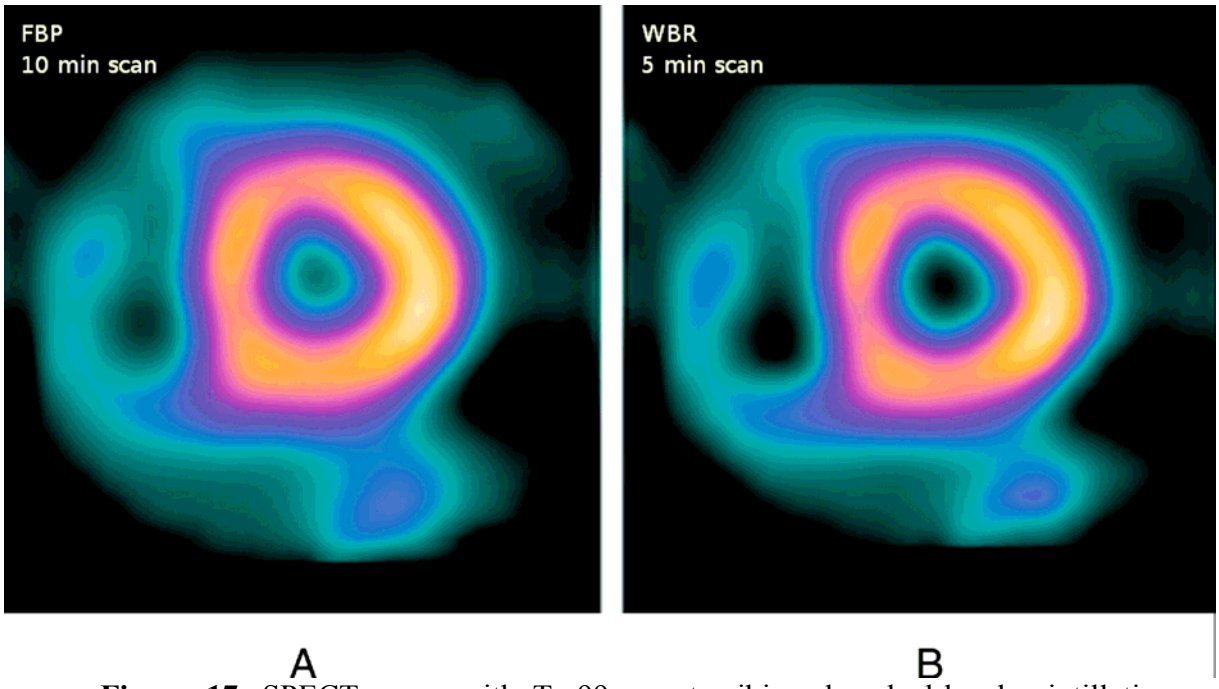

Figure 17. SPECT scans with Tc-99m sestamibi and a dual-head scintillation camera in a patient with normal perfusion acquired in 10 minutes and reconstructed with filtered backprojection (**A**) and acquired in 5 minutes and reconstructed with WBR (**B**). (Courtesy of Shuli Schwartz of UltraSPECT.

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