

WIDE BEAM RECONSTRUCTION METHOD FOR SHORTENING SPECT SCAN TIME: A MULTI-CENTER CLINICAL EVALUATION

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Objectives: Scan times of Bone SPECT typically range between 15 and 30 minutes for a single study and often result in low camera throughput, patient discomfort and possible image degradation as a result of patient movement. This study evaluates the image quality and clinical benefit of a new bone SPECT protocol, in which the scan time is reduced to half of the typical scan time in practice and the data are reconstructed using the Wide Beam Reconstruction method (WBR™).

Methods: The WBR™ technology (UltraSPECT Ltd) is based on an accurate modeling of the emission – detection process. It was designed to simultaneously suppress noise and improve image resolution. One of the WBR™ customizations is specifically for short bone scans and does not require post-filtering or user intervention. This study includes 115 patients from 4 medical centers, referred for bone SPECT. Two protocols were compared:

- 1) The hospital protocol applying the routine acquisition time and reconstruction methods. Scan time varied between sites from 18 to 30 minutes and reconstructed by either FBP or OSEM.
- 2) The WBR™ method utilizing only half of the acquired projections and therefore on the average using only 50% of the photons of the hospital protocol.

Based on blind reading, each reader answered the following questions, on a 1-100 scale: (1) clarity of bone uptake, (2) bone to soft tissue ratio, (3) overall image quality, and (4) Confidence of interpretation.

Results: For over 90% of the patients, clarity of uptake, bone to tissue ratio and image quality with the WBR™ – short scan protocol scored higher than those using the clinical – full time protocol (with significance of $p < 0.001$ respectively, using Wilcoxon signed-rank test). The confidence of interpretation score was higher with the WBR short protocol for 83 patients (77.8%) with significance of $p < 0.05$. Only two of the 115 patients (1.7%) had the WBR scored less than the hospital protocol in all questions. The table below summarizes some of the results.

	Average		Standard deviation	
	Hospital protocol	WBR™ (half scan time)	Hospital protocol	WBR™ (half scan time)
Clarity of bone uptake	82	89	18	13
Bone to tissue ratio	83	90	13	11
Overall image quality	80	89	15	13
Physician confidence level	95	96	9	7

Conclusions: Reducing bone SPECT scan time to 50% of typical clinical protocols and using the WBR™ method appears to have significant clinical benefits. In addition to improving department throughput and patient comfort, there is gain in image quality and confidence of interpretation, despite the substantially lower counts in the new protocol.