ENHANCEMENT OF I-123 MIBG SCANS IN CHILDREN USING THE WIDE BEAM RECONSTRUCTION METHOD: PRELIMINARY EVALUATION

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Objectives: MIBG scans are used extensively in the diagnosis and follow up of children with neuroblastoma. Images are evaluated for parenchymal and skeletal tumor deposits. Skeletal uptake of I-123 MIBG has major clinical implications in the initial staging and in assessment of therapeutic response. The uptake can be subtle and occasionally overlooked. This is a preliminary study, designed to assess the potential diagnostic benefit of a novel method, the Wide Beam Reconstruction (WBR™, UltraSPECT), for MIBG studies in children.

Methods: The WBR™ method was designed to simultaneously suppress noise and enhance image resolution. The method, clinically validated for bone scans, is adapted here to enhance MIBG planar images. 65 studies of 36 different patients referred for MIBG imaging were included. Data were acquired following the routine hospital imaging protocol. We adopted a standardized scoring system used in the International European High Risk Neuroblastoma Study to assess skeletal disease. The skeleton is divided into 7 anatomical regions. The intensity (graded 0-3) and extent (0-2) of MIBG uptake are recorded for each region and summed for the entire skeleton. Each study was read blindly twice: the native, unprocessed images, and the WBR enhanced images.

Results: The average scores of the WBR™ images were higher than the native images for both intensity and extent, for each individual anatomical region. The total score of the intensity for the native method was 3.67 where the WBR™ method scored 4.84. The total score of the extent was 2.78 and 3.84 respectively. Wilcoxon signed-rank tests confirmed the significance ($p<0.001$) of the difference between the two methods for intensity and extent separately, and for the sum of both - all for the entire skeleton. For skull, face and spine, the difference in intensity and extent were significant as well ($p<0.05$).

Conclusions: The WBR™ method enhances the perceived intensity and extent of I-123 MIBG uptake in neuroblastoma lesions. Lesions involving the skull, face and spine resulted in significantly higher scores compared to native images, thus potentially increasing the detectability of subtle lesions. Further study is required to evaluate the clinical benefits WBR™ image enhancement.