Comparison of parametric FBP and OS-EM reconstruction algorithm images for PET dynamic study

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An ordered subsets expectation maximization (OS-EM) algorithm is used for image reconstruction to suppress image noise and to make non-negative value images. We have applied OS-EM to a digital brain phantom and to human brain ^{18}F-FDG PET kinetic studies to generate parametric images. A 45 min dynamic scan was performed starting injection of FDG with a 2D PET scanner. The images were reconstructed with OS-EM (6 iterations, 16 subsets) and with filtered backprojection (FBP), and K1, k2 and k3 images were created by the Marquardt non-linear least squares method based on the 3-parameter kinetic model. Although the OS-EM activity images correlated fairly well with those obtained by FBP, the pixel correlations were poor for the k2 and k3 parametric images, but the plots were scattered along the line of identity and the mean values for K1, k2 and k3 obtained by OS-EM were almost equal to those by FBP. The kinetic fitting error for OS-EM was no smaller than that for FBP. The results suggest that OS-EM is not necessarily superior to FBP for creating parametric images.

Key words: parametric image, filtered backprojection, ordered subsets expectation maximization, PET