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Effects of image reconstruction algorithm on neurotransmission PET studies in humans: comparison between filtered backprojection and ordered subsets expectation maximization

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Objectives: Both reconstruction algorithms, filtered backprojection (FBP) and ordered subsets expectation maximization (OSEM), are widely used in clinical positron emission tomography (PET) studies. Image reconstruction for most neurotransmission PET scan data is performed by FBP, while image reconstruction for whole-body [^{18}F]FDG scan data is usually performed by OSEM. Although several investigators have compared FBP and OSEM in terms of the quantification of regional radioactivity and physiological parameters calculated from PET data, only a few studies have compared the two reconstruction algorithms in PET studies that estimate neurotransmission, i.e., neuroreceptor and neurotransporter binding. In this study we compared mean regional radioactivity concentration in the late phase and binding potential (BP) between FBP and OSEM algorithms in neurotransmission PET studies for [^{11}C]raclopride and [^{11}C]DASB. ***Methods:*** Dynamic PET scans with [^{11}C]raclopride in 3-dimensional mode were performed on seven healthy subjects. Dynamic PET scans with [^{11}C]DASB in 2-dimensional mode were performed on another seven subjects. OSEM images were post-filtered so that its transverse spatial resolution became similar to that of FBP with the same Hanning filter (Kernel FWHM 6 mm). In both PET studies we calculated the BP of [^{11}C]raclopride and [^{11}C]DASB by a reference tissue model for each ROI (region of interest). ***Results:*** There was no significant difference in mean regional radioactivity concentration between FBP and OSEM for [^{11}C]raclopride and [^{11}C]DASB. Only +2.4 – +3.2%, but still a significant difference in BP of [^{11}C]raclopride between FBP and OSEM was observed in the striatum. There was no significant difference in BP between FBP and OSEM in other than the striatum for [^{11}C]raclopride and in all regions for [^{11}C]DASB. In addition, there was no significant difference in root mean square error between FBP and OSEM when BP was calculated. ***Conclusions:*** The BP values were similar between FBP and OSEM algorithms with [^{11}C]raclopride and [^{11}C]DASB. This study indicates that OSEM can be used for human neurotransmission PET studies for calculating BP although OSEM was not necessarily superior to FBP in the present study.

Key words: FBP, OSEM, PET, [^{11}C]raclopride, [^{11}C]DASB