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Abstract: The PET radioligand [(11)C]PBR28 binds to the translocator protein (TSPO), a marker of brain immune activation. We examined the reproducibility of [(11)C]PBR28 binding in healthy subjects with quantification on a regional and voxel-by-voxel basis. In addition, we performed a preliminary analysis of diurnal changes in TSPO availability. Twelve subjects were examined using a high-resolution research tomograph and [(11)C]PBR28, six in the morning and afternoon of the same day, and six in the morning on two separate days. Regional volumes of distribution (V T) were derived using a region-of-interest based two-tissue compartmental analysis (2TCM), as well as a parametric approach. Metabolite-corrected arterial plasma was used as input function. For the whole sample, the mean absolute variability in V T in the grey matter (GM) was 18.3 ± 12.7 %. Intraclass correlation coefficients in GM regions ranged from 0.90 to 0.94. Reducing the time of analysis from 91 to 63 min yielded a variability of 16.9 ± 14.9 %. There was a strong correlation between the parametric and 2TCM-derived GM values (r = 0.99). A significant increase in GM V T was observed between the morning and afternoon examinations when using secondary methods of quantification (p = 0.028). In the subjects examined at the same time of the day, the absolute variability was 15.9 ± 12.2 %
for the 91-min 2TCM data. V T of [(11)C]PBR28 binding showed medium reproducibility and high reliability in GM regions. Our findings support the use of parametric approaches for determining [(11)C]PBR28 V T values, and indicate that the acquisition time could be shortened. Diurnal changes in TSPO binding in the brain may be a potential confounder in clinical studies and should be investigated further.