resulting ordering was compared between reference regions and metrics (SUVr vs BP_{ND}) using Spearman's rank correlation. **Results:** Orderings derived from BP_{ND} and SUVr images, using CBGM as RR, showed high correlation (ρ=0.93). Furthermore, this BP_{ND} derived ordering showed a high correlation with BP_{ND} derived orderings using WCB and CRWM as RR (ρ=0.97), the same was true for the SUVr derived ordering (CBGM) compared to SUVr derived orderings using WCB and CRWM as RR (range of ρ=0.98 and 0.99). **Conclusion:** The ordering of regional amyloid positivity appears to be robust against the choice of reference region. **References:** 1.Grothe et al.(2017)Neurology 89(20),2031-2038 2.Konijnenberg et al.(2018)Alzheimer's research therapy 10(1),75. 3.Gunn et al.(1997)Neuroimage 6(4),279-287.This work has received support from the EU-EFPIA Innovative Medicines Initiatives 2Joint Undertaking (grant No115952).

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MR-guided partial volume correction of 3D PET images using a split Bregman optimized parallel level set framework

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Aim/Introduction: Quantitative accuracy of PET images is influenced by the partial volume effect. In this work, we propose and evaluate a post-reconstruction partial volume correction (PVC) method with subtle MR-based guidance through parallel level set (PLS) regularization. The objective function is minimized with a non-smooth optimization technique, which avoids blurring of recovered images compared to smooth optimization. We compare performance against PLS solved with conventional smooth optimization and region-based voxel-wise (RBV) PVC. **Materials and Methods:** We utilized least-squares fidelity term (having knowledge of the blurring point spread function (PSF) kernel) along with MR-guided PLS regularization to formulate post-reconstruction PVC of PET images. To solve the minimization problem, we developed a non-smooth optimization technique based on the split Bregman method. An auxiliary variable was introduced to decouple the non-smooth part from the original problem. The non-smooth subproblem could then be efficiently solved with soft-thresholding. For the rest of the problem, we reached the approximate solution with a one-step steepest descent method to enable efficient 3D implementation. The proposed method was then assessed using the BrainWeb phantom and realistic PET simulations (n=20 noise realizations), followed by OSEM reconstruction (10 subsets, 24 iterations). Different PVC algorithms were assessed. Since RBV requires segmentation of MR images, we investigated both perfect segmentation and realistic segmentation obtained by segmenting BrainWeb MR images using SPM12. Mean percentage bias and coefficient of variability (COV) were computed. For comparison, regularization parameters in PLS methods were tuned to generate matched COV relative to RBV method. **Results:** For matched COV values (~18% for gray matter (GM) and ~42% for white matter (WM)), both RBV and PLS provided reduced bias compared to results obtained directly from pure OSEM reconstruction (27.5% for GM and 48.8% for WM). Among these methods, RBV with exact segmentation generated lowest bias (6.0% for GM and 7.4% for WM). The quantitative accuracy of non-smooth optimized PLS (bias: 11.9% for GM and 21.7% for WM) was significantly (p<0.01; paired t test) better relative to RBV with SPM12 segmented MR (13.8% for GM and 23.6% for WM) as well as smooth optimized PLS (18.0% for GM and 31.9% for WM). **Conclusion:** We propose a non-smooth optimized PLS method for post-reconstruction PVC of PET with subtle MR-guidance. The method shows better performance relative to smooth optimized PLS and RBV for realistic segmentations. **References:** None.

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[18F]FDG PET/MR brain studies: Dependency of image-derived input function on the defined volume-of-interest and its radiotracer environment

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Aim/Introduction: To show that accurate modelling of the tracer distribution in the volume-of-interest (VOI) and its corresponding background is necessary to perform an effective partial volume correction (PVC), for the purpose of calculating an accurate Image-derived input function (IDIF). **Materials and Methods:** Ten healthy controls underwent test-retest [18F] FDG brain PET/MRI examinations in a fully-integrated PET/MR (Siemens Biograph mMR). The imaging protocol consisted of a 60-min PET list-mode acquisition along with parallel MR acquisitions comprising of a 3D time-of-flight MR angiography (MRA), T1-MR and high-speed MR navigators for monitoring subject motion. Arterial blood samples (AIF) were collected as reference standard. A low-dose CT scan was performed for the purpose of attenuation correction. An automatic segmentation algorithm was used to segment three different regions (petrous, superior cervical and inferior cervical) of the internal carotid arteries from the MRA images. A brain mask was calculated from T1-w MR using SPM 12. This was done to correct for the spill-out from the brain to the artery. Motion vectors from MR navigators were used for motion correction. To recover the apparent tracer activity in the carotids, an iterative Mueller-Gartner PVC algorithm, which is aware of the spatial and temporal variability of the petrous background region was used. This bias was specifically introduced to identify the dependency of VOI and its radiotracer background on the calculated IDIF. Absolute percentage differences of the area-under-the-curve (AUC) between the IDIFs obtained from the different VOIs and AIF were calculated and reported. **Results:** Assessment of the percentage difference between AUC of IDIFs and AIF was