Impact of cerebral blood flow and amyloid load on SUVR bias

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Abstract:

Background: Despite its widespread use, the semi-quantitative standardized uptake value ratio (SUVR) may be biased compared with the distribution volume ratio (DVR). This bias may be partially explained by changes in cerebral blood flow (CBF) and is likely to be also dependent on the extent of the underlying amyloid-β (Aβ) burden. This study aimed to compare SUVR with DVR and to evaluate the effects of underlying Aβ burden and CBF on bias in SUVR in mainly cognitively unimpaired participants. Participants were scanned according to a dual-time window protocol, with either [18F]flutemetamol (N = 90) or [18F]florbetaben (N = 31). The validated basisfunction-based implementation of the two-step simplified reference tissue model was used to derive DVR and R1 parametric images, and SUVR was calculated from 90 to 110 min post-injection, all with the cerebellar grey matter as reference tissue. First, linear regression and Bland–Altman analyses were used to compare (regional) SUVR with DVR. Then, generalized linear models were applied to evaluate whether (bias in) SUVR relative to DVR could be explained by R1 for the global cortical average (GCA), precuneus, posterior cingulate, and orbitofrontal region.

Results: Despite high correlations (GCA: R2 ≥ 0.85), large overestimation and proportional bias of SUVR relative to DVR was observed. Negative associations were observed between both SUVR or SUVRbias and R1, albeit non-significant.

Conclusion: The present findings demonstrate that bias in SUVR relative to DVR is strongly related to underlying Aβ burden. Furthermore, in a cohort consisting mainly of cognitively unimpaired individuals, the effect of relative CBF on bias in SUVR appears limited.

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