QUANTITATIVE PARAMETERS DERIVED FROM FDG AND AMYLOID PET SCANS FOR CLINICAL TRIALS

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ABSTRACT

Parameters from FDG PET are derived from those brain areas that show impaired metabolism in AD. They are either expressed as ratios relative to least affected reference areas or as measures that reflect the severity of abnormality (e.g., z-scores) relative to normal controls. FDG PET scans are typically taken at resting state conditions (no sensory or cognitive stimulation in a low ambient noise and light environment). Blood glucose levels should be within the normal fasting range.

With amyloid PET, the increase of neocortical binding shows little regional differences and a global average is typically expressed as a ratio relative to a reference region (usually cerebellum or pons). Because of nonspecific white matter uptake in controls, techniques for distinction between grey and white matter are required (atlas-based or by coregistration with segmented MR scans).

In addition to standard quality assurance of tracer production and scanner, including homogeneity and correction for scatter and attenuation, the following factors can influence quantitative parameters substantially and need to be controlled:

- scanner resolution, which is usually dealt with by smoothing of high-resolution scans to a common low resolution
- time interval of data acquisition after tracer injection
- choice, definition, and reproducible placement of target and reference regions (typically as 3D volumes of interest), typically requiring spatial normalisation and rigid-body 3D coregistration of all data sets from each individual to reduce intra- and inter-subject variability

Other factors that can influence results but do not necessarily need to be homogenous across participating centres include image reconstruction methods (iterative or by filtered back projection). Statistical models for data analysis (typically ANOVA with regional values and follow-up measurements as within-subject factors) should be specified in the study protocol.

Index Terms— Positron Emission Tomography (PET), Alzheimer's Disease, Fluorodeoxyglucose (FDG), amyloid imaging, clinical trials