Cerebral blood flow and metabolic abnormalities in Alzheimer's disease

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In this review I summarize observations of PET and SPECT studies about cerebral blood flow and metabolic abnormalities in Alzheimer's disease. In very early AD flow or metabolism reduces first in the posterior cingulate gyrus and precuneus. This reduction may arise from functional deafferentation caused by primary neural degeneration in the remote area of the entorhinal cortex that is the first to be pathologically affected in AD. Then medial temporal structures and parieto-temporal association cortex show flow or metabolic reduction as disease processes. The reason why flow or metabolism in medial temporal structures shows delay in starting to reduce in spite of the earliest pathological affection remains to be elucidated. It is likely that anterior cingulate gyrus is functionally involved, since attention is the first non-memory domain to be affected, before deficits in language and visuospatial functions. However few reports have described involvement in the anterior cingulate gyrus. Relationship between cerebral blood flow or metabolism and apolipoprotein E genotype has been investigated. Especially, the *APOE* ε4 allele has been reported to increase risk and to lower onset age as a function of the inherited dose of the ε4 allele. Reduction of flow or metabolism in the posterior cingulate gyrus and precuneus has been reported even in pre-symptomatic nondemented subjects who were cognitively normal and had at least a single ε4 allele. On the contrary the relation of ε4 allele to the progression rate of AD has been controversial from neuroimaging approaches. PET and SPECT imaging has become to be quite useful for assessing therapeutical effects of newly introduced treatment for AD. Recent investigations observed significant regional flow increase after donepezil hydrochloride treatment. Most of these observations have been made by applying computer assisted analysis of three-dimensional stereotactic surface projection or statistical parametric mapping instead of a conventional regions of interest technique.

Key words: Alzheimer's disease, SPECT, PET, regional cerebral blood flow, regional cerebral metabolic rate for glucose