

EL2. PET and SPECT Analysis of Dementia

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In the past decade, positron emission tomography (PET) and single-photon emission computed tomography (SPECT) brain imaging techniques have been used extensively to investigate cerebral functions in various dementing disorders. Early investigations using PET and fluorine-18 labeled fluorodeoxyglucose (FDG) showed reduced cerebral energy metabolism in the parietotemporal association cortex in patients who were diagnosed clinically with Alzheimer's disease. Such parietal metabolic abnormalities were demonstrated recently in subjects who were not demented but genetically at risk for late-onset Alzheimer's disease and in patients who complained of only memory impairment without general cognitive declines. Regional metabolic abnormalities in Alzheimer's disease were examined more thoroughly, demonstrating early and significant metabolic impairment not only in the neocortex but also in the limbic system.

Comparisons between cerebral metabolic patterns of Alzheimer's disease and Parkinson's disease with dementia showed regional differences in the occipital and temporal cortices. Differences in metabolic activ-

ity were also present in Alzheimer's disease and diffuse Lewy Body disease, which may enable *in-vivo* distinction of these two disease entities. A newly recognized form of dementia, progressive limbic lobe sclerosis, demonstrated metabolic features distinct from those of Alzheimer's disease. Accuracy in diagnosing metabolic patterns of Alzheimer's disease has been improved greatly using recent PET and SPECT image processing techniques. This emphasizes the utility of functional imaging as a part of the clinical diagnostic work-up.

SPECT imaging using iodine-123 labeled iodo-benzovesamicol (IBVM), which binds to the acetylcholine transporter, reveals the integrity of cholinergic neurons in the brain. Recent studies demonstrated reduced IBVM binding in the cerebral cortex in patients with Alzheimer's disease. The reduction of IBVM binding is relatively small compared to that of energy metabolism, suggesting the involvement of multiple neurochemical systems. These observations will lead to more specific hypothesis of cerebral mechanisms of dementia.