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The Preliminary Study of ^{18}F -FDG PET in Diagnosis of Alzheimer's Disease

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Objective: To investigate the imaging characteristic and diagnostic criteria of ^{18}F -FDG brain PET in detecting Alzheimer's disease (AD). **Methods:** The study included in 12 normal subjects, 12 patients with AD, 6 patients with vascular dementia, 3 patients with Lewy body disease (LBD) and 2 patients with mixed dementia. The dementia severity was measured by ESD and MMSE. 12 cases had mild, 7 moderate and 4 severe dementia. 23 patients and 6 normal subjects underwent MR imaging of the brain. All participants fasted for at least 6 hours. 40 minutes after intravenous administration of 185-370 MBq ^{18}F -FDG, 2D brain scan in 25 cases and 3D scan in 10 cases were performed using SIEMENS ECAT 47scanner. The transaxial, coronal and sagittal images were then reconstructed by computer. At the same time, semiquantitative analysis was also applied to help evaluation using the ratio of mean radioactivity between cerebral lobe to cerebellum (Rcl/cb). **Results:** In normal subjects PET scan showed clear images of cerebral cortex, basal ganglia, thalamus and cerebellum with symmetrical distribution of radioactivity. 22 of 23 patients were found to have decreased uptake of FDG in the brain. 20 patients had cerebral atrophy and it also appeared in 6 normal elder people. PET images for Alzheimer's disease were classified in 6 normal elder people. PET images for Alzheimer's disease were classified 3 patterns: bilateral parietal hypometabolism in 5 cases, bilateral temporo-parietal hypometabolism in 4 cases and unilateral temporo-parietal hypometabolism in 3 cases. The Rcl/cb of AD patents in parietal & temporal was significantly decreased than normal subjects ($P < 0.05$). PET images for non-AD dementia were also classified 3 patterns: multiple and asymmetrical patch foci with decreased radioactivity in 8 cases, bilateral temporo-parietal with diffuse cortical hypometabolism in 2 cases, and normal imaging in 1 case. The hypometabolic involvement was accorded with severity of dementia. The more dementia had, the bigger hypometabolic region was. The Rcl/cb can also be indicated the dementia degree. Compared with MR imaging, 12 patients with AD had cerebral hypometabolism but only 10 had hippocampus atrophy. 10 patients with non-AD dementia had local structural foci which were seen in MR, including old hemorrhage, infarction and encephalomalacia, but these lesions were not found in AD. 1 patient with mild LBD was both negative PET and MR. **Conclusions:** Based on excluding cerebral structural lesions which are better detected by MR, bilateral or unilateral parietal or temporo-parietal hypometabolism found in FDG PET are considered as indicative of Alzheimer's disease. Semiquantitative analysis can help to evaluate the dementia degree.