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DETECTION OF BRAIN DAMAGES ON CEREBROVASCULAR DISEASE USING POSITRON CT.
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Positron CT measurement was performed for 13 stroke patients with cerebral infarctions detected by X-ray CT in the territory of middle cerebral artery. The used radiopharmaceuticals were O-15 labeled CO₂, O₂ and CO gases, and used positron CT device was Headtome-III developed in our institute. The physiological parameters which we calculated were rCBF, rCMRO₂, rOEF and rCBV. From these parameters we also calculated regional parameter of rCBV/rCBF which means rMTT. Patients with early stroke showed two types of uncoupling between blood flow and oxygen metabolism. Patients within 1-5 days after onset indicated high rOEF with low rCBF in the infarcted focus. About one or three weeks after onset rOEF was changed into low rOEF with almost normal rCBF. These changes of rCBF and rCMRO₂ may be a natural course of ischemic acute stroke. About one month after onset infarcted focus showed low rOEF and low CBF, and two or three months later the lesion gradually altered matched change of rCBF and rCMRO₂. rMTT had a good correlation with rOEF. rMTT may be useful parameter for single photon emission CT measurement, because SPECT can be measured rCBF by I-(2)-IMP and rCBV by Tc-99m-RBC. The usefulness of positron CT measurement for diagnosis of cerebral infarction were

explained by means of demonstrating several clinical cases.

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EVALUATION OF CEREBRAL DYSFUNCTION IN DEMENTIA USING POSITRON EMISSION TOMOGRAPHY.
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Recent development of positron emission tomography (PET) technique has enabled us to study cerebral circulation and metabolism in man. This can greatly contribute better understanding of disturbed hemodynamics and energy metabolism in pathological state of cerebro-vascular diseases, brain tumor and degenerative disorders by measuring cerebral blood flow, blood volume oxygen and glucose utilization in absolute units.

In Tohoku University, clinical study on brain aging and dementias has begun using PET techniques since September in 1983. The following points were extensively examined in patients with multi-infarct dementia (MID) and Alzheimer's disease (AD).

- (1) the relationship between supply and demand of glucose and oxygen
- (2) the relationship between glucose and oxygen utilization

Five AD, four MID and normal controls were studied with PET and the O-15 steady state inhalation and the F-18 fluorodeoxy-glucose combined methods. Values of glucose supply (CBF multiplied by arterial glucose) and oxygen supply (CBF multiplied by arterial oxygen content), fractional extraction of glucose and oxygen (GEF and OEF) and cerebral glucose and oxygen utilization (CMRGl_c and CMRO₂) were obtained in the tomographic planes of brain (OM+3,5,7 cm).

Mean cortical values of glucose and oxygen supply were significantly decreased both in MID and AD compared with controls. In these conditions, OEF was significantly increased in AD and only slightly increased in MID. GEF was never increased both in MID and AD. Reflecting this difference of fractional extraction between glucose and oxygen, significant decrease of CMRGl_c and CMRO₂ were observed in MID. Lower metabolic ratio (CMRGl_c to CMRO₂) in AD might indicate alternative energy production without blood-borne glucose.

Informations from PET study described in absolute units of flow and metabolism can contribute to reveal pathophysiology of cerebral disorders.