
Cerebral blood flow and oxygen consumption is measured by continuous inhalation of O-15 labelled O2 and CO2 using a positron tomograph. Though cerebral function may be evaluated by blood flow measurement only in normal subjects, the detection of the uncoupling between blood flow and metabolism has a highly diagnostic value and allow to assess the pathological condition of the tissue. Some technical problems of the method is also evaluated.


The metabolism of C-11-glucose in the brain was studied in rats for understanding the Positron Emission Tomographic findings. C-11-glucose was prepared by the photosynthetic method and was given to wistar rat orally. The rats were decapitated at 10, 20, 30, 45 and 60 minutes after administration of C-11-glucose. The brain was immediately frozen with liquid nitrogen and the cerebrum was removed. Then it was homogenized with perchloric acid. The brain sample was analyzed by the modified method of Gaitonde and others. Ion exchangers (AG 50W and Dowex 1) were used. The concentration of glucose, amino acid, lactate and pyruvate were determined chemically as well as radioisotopically. After administration of C-11-glucose, the high concentration of C-11-radioactivity was observed in the amino acid pool. About 62% of radioactivity was observed in amino acid fraction at 20 and 30 minutes after administration. The free glucose was less. The results suggest that the image of Positron Emission Tomography using C-11-glucose reflects the relative cerebral glucose metabolism.


Patients with cerebrovascular dementia were studied about the relations between severity of dementia, cerebral glucose metabolism and metabolic response to verbal stimuli by Positron Emission CT using Carbon-11-glucose. Five normal volunteers and 11 cerebrovascular dementia patients were studied. The Regional Distribution of Glycogenic Metabolites (RDM) values in vascular dementia were significantly low compared with normal volunteers. Significant difference exists in frontal cortex between mild-moderate and severe dementias. But in temporal cortex, there was no significant difference between mild-moderate and severe dementias. In mild-moderate dementias, the RDM increases significantly respond to the verbal stimuli in frontal and temporal cortex. In severe dementias, metabolic response was less or lacking. The cerebral Blood Volumes were measured using Carbon-11-carbon monoxide. The effects of intravascular tracers were almost negligible. Our results suggest the possibility of improvement of mental functions on treatment with suitable therapy and circumstances. Our methods are useful to study the physiological functions of vascular dementia.