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QUANTITATION OF BLOOD FLOW AND OXYGEN CONSUMPTION OF THE BRAIN AND TUMOR TISSUE USING A POSITRON NUCLIDE, OXYGEN-15. M.Ito, J.Hatazawa, Y.Abe, H.Fukuda, S.Yosioka, K.Kubota, K.Ito, T.Matsuzawa. Kosankin-ken, Tohoku Univ. T.Ido, S.Watanuki. Cyclotron RI Center, Tohoku Univ. Sendai, Miyagi.

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.

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STUDIES ON THE METABOLISM OF CARBON-11-GLUCOSE IN THE BRAIN. T.Soeda, S.Kitamura, T.Ujike, T.Kato, A.Terashi and M.Iio* The 2nd Dept. of Internal Medicine, Nippon Medical School. Tokyo. *Dept. of Radiology, Nakano National Hospital.

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 radiologically. 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.

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11C-GLUCOSE AND 11CO₂ POSITRON EMISSION TOMOGRAPHY OF HUMAN BRAIN TUMORS: THE DIFFERENCE OF REGIONAL GLUCOSE METABOLISM AND CEREBRAL CIRCULATION ON BENIGN AND MALIGNANT BRAIN TUMORS. T.Tsukiyama, Y.Makiyama, S.Hirano, H.Ohata, N.Doi, T.Tsubokawa, K.Sato, R.Kamata. Nihon Univ. M.Iio* National Chest Hosp.* Tokyo.

Fifteen cases suffered from brain tumor were studied by positron emission tomography (PET). Five cases of them had meningotheial meningioma, and other ten cases suffered from benign and malignant gliomas. According to our PET study for meningioma and benign glioma, r-glucose metabolism and r-cerebral circulation in the tumor and peritumorous area changed with coupling of them depend on the X-ray CT density. On the other hand, malignant glioma shows quite variety of changed of r-glucose metabolism and r-cerebral circulation in the tumor and peritumorous area. Some parts of tumor show luxury perfusion and some other parts show anerobic metabolism without any relation of X-ray CT findings or histological findings. This might be caused by some infiltration of rest tumor cell or remained cytotoxic effect of edema fluid induced by the tumor.

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POSITRON EMISSION TOMOGRAPHIC STUDIES USING CARBON-11-GLUCOSE IN CEREBROVASCULAR DEMENTIA. T.UJIKE, T.SOEDA, S.KITAMURA, T.KATO, A.TERASHI, M.IIO* The 2nd Department of Internal Medicine, Nippon Medical School. Tokyo. *Department of Radiology, Nakano National Hospital. Tokyo.

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 (RDGM) 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 significance between mild-moderate and severe dementias. In mild-moderate dementias, the RDGM 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 circumstance. Our methods are useful to study the physiological functions of vascular dementia.