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LOCAL CEREBRAL BLOOD FLOW AND METABOLISM OF EXPERIMENTAL BRAIN TUMOR - A DOUBLE RADIO-AUTOGRAPHIC STUDY. H.Orii, A. Tamura, T. Nagashima and M. Matsutani, Tokyo Metropol. Inst. Med.Sci., Metropol. Komagome Hospital and Teikyuu Univ., Tokyo.

An experimental model of brain tumor was established using RG-12 glioma transplanted semi-stereotactically in CD Fischer rat basal ganglia. A reproducible tumor model was obtained after 7 days through 14 days, producing a small tumor of ca. 1 mm diameter and a large tumor of ca. 3 mm diameter respectively.

Local cerebral blood flow study was performed using C-14-iodoantipyrine radioautography and metabolic study was performed with C-14 2-deoxyglucose. Blood brain barrier study was performed using C-14  $\alpha$ -aminoisobutylic acid and I-131 human serum albumin double autography.

It was found that in the small tumor, tumor blood flow was relatively high, whereas in the large tumor, there appeared a ring-formed area of relatively high blood flow in the peripheral part of the tumor, and a low blood flow area in the center of the tumor, where no necrosis was observed.

Double autoradiographic study on blood brain barrier revealed that it was affected in a similar pattern, revealing the tumor center low in leakage and high in the area surrounding it. Metabolic study with C-14 2-deoxyglucose showed a similar pattern.

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APPROACH TO QUANTITATIVE AUTORADIOGRAPHY WITH POSITRON EMITTER. K.Takahashi, M.Murakami, I.Kanno, S.Miura, H.Sasaki, F.Shishido and K.Uemura. Research Institute of Brain & Blood Vessels-AKITA, Akita.

Autoradiography (ARG) is useful to determine the distribution of radiopharmaceuticals. Quantification of ARG is essential in the study of metabolism of the radiopharmaceuticals in normal and diseased state in animals. Recently, many new positron emitting radiopharmaceuticals have been introduced and we tried the easy technique for quantification of ARG with positron emitter.

The animal administered radioisotope was cut into slices in the usual way. Assuming two neighboring slices have the same distribution of the radioisotope, the following procedures were carried out. The samples punched from several areas of one of the slices were counted in a properly calibrated well counter. Subsequently the autoradiogram of the punched slice and another one were prepared. Optical densities of the punched areas of the autoradiogram were plotted against radioactivities measured by the well counter. By using this relation curve we can determine the absolute values of activity ( $\mu\text{Ci/g}$  or  $\text{cps/g}$ ) as well as up-take ratio (% injection dose/gram tissue) at any region of the autoradiogram.

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A DYNAMIC STUDY OF INTRAVENOUS ADMINISTRATION OF N-13 AMMONIA IN MAN WITH POSITRON COMPUTED TOMOGRAPHY. K.Yoshida\*, F.Shishido, S.Tamachi, H.Ikehira, K.Suzuki, K.Tamate, T.Irie, T.Yamazaki, H.Imai\*, Y.Masuda\* and Y.Tateno. The National Institute of Radiological Sciences. \*The Third Department of Internal Medicine, Chiba University School of Medicine. Chiba.

A positron computed tomography (PCT) with POSITOLGICA-II was performed to study the time course of concentration of N-13 in the heart, lungs and liver. Serial PCT scans for 30 seconds or 1 minute were obtained immediately after intravenous administration of N-13 ammonia.

The first scan gave cardiac blood pool images and these intracavitary N-13 activity disappeared rapidly thereafter. On the other hand, the myocardial N-13 activity remained nearly constant for the several minutes and high quality cross-sectional images were obtained. The patients with myocardial infarction revealed diminished accumulation of N-13 at the sites corresponding to the infarction specific ECG findings. In the lung, there was a moderate uptake of N-13 and this was washed out more slowly than in the blood pool. The liver revealed a late uptake of N-13. These observations may represent transference of metabolized N-13 ammonia.

As the results, the present study clearly demonstrated the usefulness of N-13 ammonia as an imaging agent not only to the heart but also to the lungs and liver.

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APPROACH FOR NONINVASIVE METHOD FOR QUANTITATIVE MEASUREMENT OF RADIOACTIVITY IN THE ARTERIAL BLOOD IN PET STUDY. S.Miura, I.Kanno, M.Murakami, K.Takahashi, H.Sasaki, F.Shishido, T.Yamaguchi and K.Uemura. Research Institute of Brain & Blood Vessels-AKITA, Akita.

A quantitative measurement of radioactivity in the arterial blood is indispensable in positron emission tomography (PET) study. Especially, in single breath inhalation method, the arterial blood must be continuously withdrawn to be measured the radioactivity in it, which causes invasive and troublesome process as a routine examination.

We have examined for the technique to estimate the radioactivity in the arterial blood by the continuous external measurements of the radioactivity in the lung, the heart or the muscles instead of the arterial blood sampling. The detection of the radioactivity were carried out using the informations of the difference of the time of flight (TOF) of positron annihilation rays. In the case of the lung measurement, the changes of the volume of the lung between the expire and the inspire phases prevent the quantitateness. In the case of the heart measurement, the time resolution of TOF detectors is not short enough to detect the radioactivity only in the ventricles. We experimentally examined about the problems described above.