133

ANALYSIS OF REGIONAL CEREBRAL BLOOD FLOW AND OXYGEN UTILIZATION OF PERITUMORAL AREA USING PET IN PATIENTS WITH CEREBRAL TUMORS ~ESPECIALLY, CORRELATION WITH HISTOLOGICAL AND X-RAY CT FINDINGS~.

Y.Ikeda, Y.Ohiwa, T.Miwa Tokyo Medical College. M.Iio National Nakano Chest Hospital.

We studied 25 patients with cerebral tumors by means of PET in Oxygen-15 steady state technique, and measured regional CBF and $CMRO_2$ in peritumoral white and gray matter. From view points of histological findings, we classified patients into two groups. One is extra axial tumor (=Group E, 10 patients: all are meningioma), and the other is intra axial tumor (=Group I, 15 patients: 11 glioma, 4 metastatic tumor). And then we examined patients whether they have peritumoral LDA or not on X-ray CT.

Results. The following numerals in parenthesis represents CBF (the former) and $CMRO_2$ (the latter),both unit is ml/min/100g. Peritumoral white matter··· Group E, LDA(+) (18,1.2), LDA(-)(26,2.2) Group I, L(+)(14, 1.2), L(-)(20,2.0). Peritumoral gray matter··· Group E, L(+)(27,1.9), L(-)(35, 2.9), Group I, L(+)(23,1.6), L(-)(33,2.5).

Both peritumoral white and gray matter, low value of CBF and $CMRO_2$ showed in LDA(+) group in comparison with LDA(-) group. And low value showed in Group I (intra axial tumor) in comparison with Group E (extra axial tumor).

135

Kinetics of carbon-11 labeled N-methyl, α-methyl benzylamine in the brain.

H.Shinotoh, O.Inoue, K.Suzuki, M.Iyo, T.Yamasaki, Y.Tateno, H.Ikehira. National Institute of Radiological Sciences, Chiba.

Consideration of the central role of amines in brain function makes it appear likely that most of the pathological states of the brain manifest themselves as abnormalities in neurohumeral amine metabolism or kinetics. The unique ability of tracer materials to assess biochemical kinetics in vivo suggests a major role for labeled amines in the study of normal and altered brain function.

Carbon-11-labeled N-metyl, α-methyl benzylamine (MMBA) was developed for the study of the kinetics of amines, especially the permeability and the binding sites of amines in the brain. In the mouse brain, the high uptake and rapid wash-out of ^{11}C-MMBA was observed. The kinetics of ^{11}C-MMBA was altered considerably by the stress of forced swimming and the pretreatment with reserpine and ß-phenethylamine and the results suggest that the uptake and the binding sites of amines is changing with the alteration of the brain state. The kinetics of ^{11}C-MMBA in the human brain was studied with PET. The high uptake ^{11}C activity was observed following i.v. injection of ^{11}C-MMBA. No wash-out of ^{11}C activity was observed in some subjects, while ^{11}C activity was gradually cleared in some subjects. The result suggests that the binding potential is different between normal subjects or changing according to the subject's condition.

136

AUTORADIOGRAPHIC AND DYNAMIC MEASUREMENT IN BRAIN OXYGEN UTILIZATION USING $^{15}O_2$ SINGLE INHALATION AND POSITRON EMISSION TOMOGRAPHY.

S.Miura, I.Kanno, H.Iida, M.Murakami, K.Takahashi, H.Sasaki, F.Shishido, S.Higano, A.Inugami and K.Uemura. Research Institute for Brain and Blood Vessels-AKITA, Akita.

Regional cerebral oxygen extraction fraction (OEF) and regional cerebral oxygen utilization ($CMRO_2$) can be measured using autoradiographic and dynamic methods with $^{15}O_2$ single inhalation and PET, we examined the quantification of these methods by simulation and clinical studies.

In simulation study, we have found that the underestimation of about 10 % in $^{15}O_2$ arterial activity resulted in the over-estimation of about 10 % in $CMRO_2$ and the more PET scan duration is long, the more the relationship between tissue activity and $CMRO_2$ value becomes inferior in linearity. In clinical study, $CMRO_2$ values of autoradiographic and steady state measurements were related comparatively. However, dynamic $CMRO_2$ resulted in the higher values than that of steady state.

137

THE METHOD FOR MEASUREMENT OF CEREBRAL BLOOD VOLUME AND ITS REACTIVITY TO $PaCO_2$ CHANGE: EVALUATION OF ACCURACY.

I.Kanno, M.Murakami, K.Takahashi, S.Miura, H.Iida, H.Sasaki, Y.Shoji, E.Hagami, F.Shishido, A.Inugami, S.Higano and K.Uemura. Research Institute for Brain & Blood Vessels-AKITA, Akita.

Physiological reactivity of cerebral blood volume (CBV) to $PaCO_2$ change using ^{11}CO inhalation method and PET was measured. Twenty one-min scans were started at five minutes after 50 mCi ^{11}CO inhalation. Arterial blood was sampled every min. In each image 0.3 to 0.9×10^6 counts were obtained. During the scan $PaCO_2$ was changed by CO_2 inhalation and hyperventilation. The preliminary studies revealed a relationship between CBV and $PaCO_2$ in the whole cerebrum; $CBV=0.065 \times CBV + 1.39$. The accuracy of this measurement was examined from three aspects. The anatomical adjustment was shown to be extremely important to obtain a net CBV of brain parenchyma because most of blood volume was in the extracerebral superficial veins. The statistical noise under the present condition was evaluated as 5 % COV with the size of a region of interest of 4 cm diam. The physiological decay of the ^{11}CO-RBC was found not to be negligible in the present activation study. The half-life of the physiological decay showed a positive correlation with the hematocrit.