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## REGIONAL INTERRELATIONSHIPS BETWEEN CEREBRAL OXYGEN CONSUMPTION AND GLUCOSE UTILIZATION IN DEMENTIAS: A POSITRON EMISSION TOMOGRAPHY STUDY.

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Five patients with Alzheimer's disease (AD) (mean age=60), four patients with multi-infarct dementia (MID) (mean age=72) and seven non-demented control persons (mean age=67) were studied to obtain values of regional cerebral blood volume (CBV, C-11 carbon monoxide inhalation), cerebral blood flow (CBF), oxygen extraction fraction (OEF) and oxygen consumption (CMRO2) (O-15 steady-state inhalation), and glucose utilization (CMRGlC) (F-18 fluoro-deoxy-glucose method). Value of lumped constant for normal persons was tentatively used for calculation of CMRGlC.

Three tomographic planes at OM+3, 5 and 7 cm were obtained. Sixteen regions of interest were set in the cortical areas on the functional images of CBF, OEF, CMRO2, CMRGlC and CBV. Mean cortical values of these parameters were obtained in each patient.

In AD patients, CBF and CMRO2 decreased variously depending on the duration of the disease. OEF significantly increased indicating lack of oxygen supply to brain. Ratio of CMRGlC to CMRO2 decreased significantly.

In MID patients, decrease of CMRO2 and CMRGlC firmly coupled. OEF increased slightly but not significant compared with controls.

Mean hemispheric values of CBV was significantly lower in AD patients than in controls.

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## EXPERIMENTAL BRAIN TUMOR AND F-18-FdUrd - BASIC INVESTIGATION AS A NUCLEIC ACID METABOLISM TRACER -

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The potential usefulness of F-18-fluoro-deoxyuridine (FdUrd) as a nucleic acid metabolism tracer had already been reported in the previous meeting. This time, the characteristics of FdUrd was investigated more in detail by using multiple labeled autoradiographic (ARG) technique recently we had reported.

C-14-thymidine ARG revealed the accumulation of C-14 only in the periphery of the experimental brain tumor in rats, but hardly in the part of central necrosis. C-14-aminoisobutyric acid ARG which has been used for demonstrating BBB breakdown showed, however, that the distribution of C-14 was homogeneous in the brain tumor. On the other hand, FdUrd ARG image disclosed high accumulation of F-18 in the periphery of the brain tumor, but also in the part of central necrosis some uptake was recognized. Tissue sampling analysis revealed that F-18 radioactivity in the acid insoluble and acid soluble nucleotides fraction in the brain tumor increased with time.

These results suggest that FdUrd will be a useful nucleic acid metabolism tracer in the clinical application of positron emission computed tomography.

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## CLINICAL EXPERIENCES OF POSITRON EMISSION COMPUTED TOMOGRAPHY IN THE NEUROSURGICAL FIELD

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Since April 1983, the positron emission computed tomography (ECAT-II) has been applied to clinical use in Tohoku University. F-18-FDG, C-11-CO, C-11-methionine, O-15-O2 and O-15-CO2 were used as tracers for investigating brain tumors and cerebrovascular disorders.

The results obtained through the study is reported from the view points as follows; 1) in the brain tumor, correlation between the histological malignancy and the metabolic characteristics, and the changes of physiological parameters before and after the treatment (radioimmunochemotherapy), 2) in Moyamoya disease, the investigation into the nature of "re-build up" phenomenon on EEG, and the evaluation of surgical treatment for this disease and 3) in arterio-venous malformation, metabolic and perfusion changes in and around the malformations.

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BABY CYCLOTRON BC3015. Y.Toda, I.Suzukawa, Y.Kaneda, H.Yoshida, T.Tanaka and T.Yamada. The Japan Steel Works, LTD. Muroran.

We, The Japan Steel Works, have delivered BABY CYCLOTRONS, types BC105, BC107, BC168 and BC1710, which produce the short lived radionuclides ( $^{11}\text{C}$ ,  $^{13}\text{N}$ ,  $^{15}\text{O}$  and  $^{18}\text{F}$ ) for nuclear medicine, to domestic and foreign customers. In 1983, we got the order of new machine BC3015 from University of Pennsylvania in Philadelphia (U.S.A). BC3015 has many features, such as step-wise variable energy, acceleration of four particles, self-shielding function for radiation leakage, etc. The main specifications of BC3015 are shown below.

## 1. Performance Ratings (BC3015)

Particle	Energy (MeV)	Current (uA)
Proton	30, 22, 13	60
Deuteron	15	60
Helium-3	40, 23, 17	30
Helium-4	30, 22, 13	30

## 2. Major Components (BC3015)

Magnet	Yoke Shape : $\phi 2.75(\text{m}) \times 1.6(\text{m})\text{H}$ Extraction Radius : 52 (cm) Average Field : 15.4 KG
RF system	Type : $2 \times 45^\circ$ dee Oscillation System : M.O.P.A. Frequency : 47, 40, 31 (MHz) Harmonics : 2, 4
Ion Source	Type : Hot Cathode PIG
Deflector	Type : Electrostatic