Regional cerebral blood flow (CBF) can be measured using positron emission computed tomography (PECT) and the continuous inhalation of C[15O]2. However, there are many error factors in this technique. Therefore, it must be very carefully to evaluate the PECT data. To use the PECT data, the cross-calibration factor of the arterial blood activity needs to be determined. The CBF values change with fluctuation of cross-calibration factors and the arterial blood with accurately, to be measured PECT images with precision. It is also necessary to make an effort for minimized errors. It is done the arterial blood sampling of two times during the measurement of PECT images. The deviation of the sampled arterial blood activity are 4.3%, 6.2% and 5.8% for CO2, O2 and O2-plasma, respectively. After corrected the blood activity with blood weight, the deviation is improved 1.7%, 3.7% and 2.7% for CO2, O2 and O2-plasma, respectively. It have to do quality control of using devices and all of about this method. In this report investigated variation of CBF by fluctuation of cross-calibration factors and measured arterial blood activity. The CBF values change with fluctuation of arterial blood activity compare with fluctuation of cross-calibration factors largely.

Two models for calculation of partition coefficient (p) of H2O were proposed. The one is a "combined method", which uses a ratio of the image of the C[15O]2 steady state inhalation method (Bs) to that of the H2[15O]2 autoradiographic method (Ba) and each arterial radioactivity (As and Aa). From the table of /{(Aa/Aa)*exp(-kt)}dt/(k+mp+Bs) and /{(Ba/Bs)dt}, k is determined, then p=KS/(k+mu)*B(Aa/As) where mu is a decay constant of 11O. The other is a "different accumulation time" method, which uses two flow images, k1 and k2, from a single H2[15O]2 autoradiographic study but different accumulation time, p is given as p = (k1-k2)/(g1-k1); where g1 and g2 are reciprocals of slope of the integral (I) to k nomogram given as I = [{Aa}^*exp(-kt)]dt. Either methods resulted in the underestimation of p as 0.5 to 0.6 as a mean value. Main reason of such underestimation seems to be the dispersion in the measured artery curve obtained in H2[15O]2 autoradiographic study. After correction for the dispersion p values were increased to 0.8 to 0.9. However, these models seemed to be difficult to apply in routine use due to too low signal-to-noise ratio.

Cerebral blood flow measurement with 0-15 H2O continuous infusion system was presented. It has many advantages such as low exposure to airway tract, accurate control of infusion volume of radioactivity. With this system, we studied CBF reactivity to PCO2 in 3 normal volunteers, 5 patients with p/o moyamoya disease, 2 patients with TIA and 1 patient with cerebral infarction. For the 1 mmol increase in PCO2, there is a mean hemispheric increase in CBF of 2.1 ml/min/100cc in normal volunteers. Reduced CBF reactivity to PCO2 change was observed in the area of increased CBF of the patients with p/o moyamoya disease. Early images seemed to be useful for the close representation of CBF images.