Remarks on Cerebral Blood Flow Measurement of Brain Tumors with Two Compartmental Method

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Measurement of the partition coefficiency of ^{133}Xe between the blood and brain tumor tissue is troublesome.

The rCBF values of brain tumors based on ^{133}Xe clearance measurement are obligated to compute under the same postulation as normal human brains. Whatever rCBF may be calculated from the ^{133}Xe clearance curve, the transfer of ^{133}Xe itself reflects the cerebral blood flow dynamics.

Therefore, we measured the rCBF of brain tumors with the method of comparing the difference of the clearance curve of brain tumors with normal curves.

With a gamma scintillation camera and a date store playback accesory, the time series date for 8 sec of sampling time were computed for 15 min. with two compartmental method due to Lassen.

The computed model equation (YY) in 5 control cases aged 21—44 years was $YY=229\,4e^{-0.1153+}+706e^{-0.0190+}$, showing the average blood flow 47ml/100g/min.

When the deviation of clearance curves of brain (Yi) from the model curve (YY) was computed, the time series date of the difference between log YY and log Yi were divided into two parts, and the one part was cantained of 1st point to 40th point, the other part was 51st to 100th.

The gradients of the regression lines for each part obtained by the method of least squares were computed to show the difference in a indivisual clearance curve from the model curve. These differences were experessed as K_1 difference and K_2 difference.

For example, the K difference value more than double the standard deviation indicated that ^{133}Xe was significantly washed out compared with control cases. The standard deviation of K_1 difference was 0.00178, K_2 difference 0.00251. One case report of meingiomas was demonstrated in this method. K_1 difference value in the region where angiographycally showed hypervascularity was+0.0126, in the region with partial hypervascularity was+0.0026, and in the region without hypervascularity −0.0088.

The values of K_1 difference seemed to relate with hyrervascularity.

We gained the more strict data in brain tumor than that obtainable by ordinaly method, and will make a different diagnosis of brain tumors with this method.