Measurement of Regional Cerebral Blood Flow by External Tracing of Radioisotope

M. YOSHIMURA

The Second Department of Internal Medicine, Nihon Medical School, Tokyo

The regional cerebral blood flow was measured from the regional cerebral blood volume and regional circulation time with the method of external tracing of RIHSA (RI) in this report. This method has been developed under the following foundermental dividing procedure of regional count rate of RI on two segments in brain systems using with a scintillation detector which involves 2 crystals having a different focal distance respectively. These two crystals forming a concentric circle, the outer side one had a filer behind and it's counting rate was lead to separate channel of the recorder as a different energy base compared to another one. These different two foci of those crystals were separated with special collimator, laid on detector's head.

Hence, the true external count rate of regional cerebral segment A (under dividing of two segment A and B on human brain systems) at equilibrium phase of injected RIHSA eliminated the contribution factor from B was calculated with following equation

$$R_L^A = \frac{\lambda^B R_L - R_S}{\lambda^B - \lambda^A}$$

where, R is the count rate of the crystal with long focus distance, R is the count rate of short focus distance crystal and λ^A, λ^B are the contribution factors from space A and B to R_L and R_S each other, which were determined from the space A and B in phantom modified to human cranial skull.

The above equation is able to deploy to a detector involving much more numbers of crystals (3 or the more) with 3 or the more focus-distance respectively. The author discussed in this report on a possibility for the determination of regional (ca 2~3cm^3 of brain tissue) cerebral blood flow by sterotaxical technique using with this 3 foci scintillation detectors.

3) Thyroid Gland

The Kinetic Study on the Metabolism of Iodine

S. TANAKA

National Institute of Radiological Sciences, Department of Clinical Research

There are many reports on the kinetic studies of iodine metabolism. The most popular methods consists in the serial determinations of the uptake of ^{131}I by thyroid gland, in the estimations of the organic and inorganic ^{131}I in blood, and of the amounts of the excretion of ^{131}I in urine and feces after the administration of ^{131}I.

This report is different from those usual methods in the following respects.

1. The amount of ^{131}I in a total body was measured by a human counter for 20 to 30 days following the administration of ^{131}I. The distribution of radioiodine in the body was determined by a profile scanner.

2. The metabolism of inorganic iodine and of thyroxine was studied separately on the same subject. The over-all kinetics of iodine

was calculated from both the metabolism of inorganic and organic iodine.

3. The formula for the calculation of iodine metabolism was based on a program of Dr. Fukuda, my co-worker. This program is characterized by an analysis of multicompartments in a body from a relatively few inputs.

Three interesting results will be summarized as follows.

1. It was possible to determine the rate coefficiency and pool size of iodine from the kinetics of the metabolism of in- and organic iodine.

The radioactivities in a total body and in the region of the calf were determined every day following the administration of ^{131}I in normal and hyperthyroid subjects with blocking the thyroid gland by antithyroid drug. The study was also done in the same subjects after the administration of ^{131}I-T_4.

From the both results, the rate coefficiencies and pool sizes of three compartments, e.g., the thyroid gland, in- and organic iodine in the extrathyroidal tissues were calculated.

The over-all metabolism of iodine was also studied on the same subjects by giving ^{131}I.

The quite similar results have been obtained from the both separate and over-all studies.

2. The kinetic study on the thyroxine in liver.

A profile scanning was performed 30 minutes, 3 hours, and then every 24 hours after the intravenous administration of ^{131}I-T_4. The most prominent peak was found in the regio of the liver. The contribution of the radioactivities from the ^{131}I in the blood contained in the neighbour organs, such as heart, spleen, and stomach etc., were estimated by a profile scanning after the administration of RISA. The liver took approximately 40 per cent of ^{131}I-T_4 within one hour after the injection, and then released it exponentially. From the amounts of ^{131}I in the total body, liver, and blood, we made a model with three compartments, e.g., the liver, blood and extrahepatic tissues. Each rate coefficiency of these compartments was calculated by Fukuda's program using a digital computer. The rate coefficiency from the liver, which means the excretion of ^{131}I-T_4 from the liver showed a negative result, indicating not a single compartment of T_4 in the liver.

3. The relation between the amount of ^{131}I in a total body and in the other tissues.

The total amount of ^{311}I in the body was found to be estimated from the uptake of ^{131}I by the thyroid gland and the relative amount of ^{131}I in the some part of the body. The amount of ^{131}I in the thyroid gland and in the area of calf was determined by the usual method for external counting. The per cent of the uptake of ^{131}I by the thyroid gland was added by the relative amount of ^{131}I in the regio of the calf, so as to 100 per cent for the initial value. Then both the thyroid and calf was counted and added every day. By this method a similar result was obtained, as the total amount of ^{131}I in the body was estimated by a human counter.

Effects of Chronic Iodide Ingestion on Thyroid Hormone Synthesis in Euthyroid and Hyperthyroid Japanese Subjects

S. NAGATAKI

The Third Department of Internal Medicine, Faculty of Medicine, University of Tokyo, Tokyo

Absolute iodine uptake (AIU), PBI and $^{131}T_3$-resin sponge uptake (RSU) were determined in 15 euthyroid and 6 hyperthyroid Japanese subjects. Euthyroids were taking their customary diet which included moderate to large quantities of food rich in iodine.