Studies on Radiopharmaceuticals —Synthesis of New Renoscanning Agents and Their Evaluation—

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An attempt has been made to produce a new renoscanning agent which is faster excretion rate, lesser radiation exposure and cheaper cost than those of chlormerodrin. An agent, 1-(4-iodophenyl)-3-([3-(chloromercuri)-2-methoxypropyl] urea (abbrev.: IPCM) labeled with ^{125}I was prepared for the first time in four steps with 4-iodoaniline labeled with ^{125}I as a starting material. The kidney-affinity of the synthetic compound was examined by using male wistar rats. IPCM labeled with ^{125}I was given intravenously to the animals at a dose of 2.5 mg/kg (specific activity: 8.6 μCi/mg).

The distribution of ^{125}I in the organs at various intervals after dosing was calculated as a ratio to the concentration of muscle. The average ratio of kidney to muscle at different times was as follows; 43, 80, 104, 153, 200, 101 and 185 at 0.5, 1, 2, 3, 6, 12 and 24 hours, respectively. The kidney accumulated more ^{125}I than any other organs. The liver deposited less ^{125}I than the kidney, but much more than any of the other organs. When the whole body retention between chlormerodrin and IPCM labeled with ^{203}Hg was compared, it was found to be similar biphasic excretion curves for the two copounds. The rate of IPCM's excretion via the urine and feces were nearly the same. Some problems for the clinical application of IPCM were discussed in take account of the use of ^{123}I in future.

Uptake of Various Labeled Compounds into the Tumor Tissue

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Thirty-six labeled compounds were prepared and their affinity for the malignant tumor were examined by using the rats transplanted with Yoshida Sarcoma subcutaneously.

Of these, relatively high uptake into tumor tissue was observed in ten compounds of ^{131}I-fibrinogen, ^{67}Ga-citrate, ^{114m}In-chloride, ^{67}Ga-nitrate, ^{203}Hg-acetate, ^{114m}In-citrate, ^{46}Sc-citrate, ^{131}I-albumin, ^{46}Sc-chloride and ^{206}Bi-acetate. ^{131}I-fibrinogen and ^{131}I-albumin are protein. Hg and Bi are the elements of the sixth period in a periodic table and these elements have strong protein binding capacity. Ga, In and Sc are the elements of group

III in a periodic table and are non-specific in chemical and biological properties.

Although it is important that a large amount are accumulated in tumor, in external counting method high tumor-organ concentration ratio is more important. Considering these points, ^{67}Ga-citrate, ^{131}I-fibrinogen, ^{203}Hg-chlormerodrin, ^{131}I-albumin are excellent in clinical scintillation scanning.

It is thought that ^{131}I-fibrinogen is taken by protective process and ^{131}I-albumin is taken as nutrition in tumor. The binding capacity of these mercuric and bismuth compounds to protein is strong, and retention value of these compounds in the tumor was nearly in proportion to the binding capacity to protein. So, these compounds will be carried in tumor by serum protein after i.v. injection. Retention value decreased the slowest as time elapsed in tumor tissue comparing the other principal organs, except in the kidney.

Ga, In and Sc have weak protein binding capacity, but uptake in tumor is so great. In case of Ga, carrier-free ^{67}Ga-citrate and ^{67}Ga-nitrate are much taken in tumor as gallium ion.

Automatic Data Storage and Processings for the Liver Scintigram Using CCTV and Small Computer

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The liver photo-scintigram is converted to the digital image by the data-storage-system combined with a CCTV and a small computer. The first circuit separates the video signal and two synchronizing signal from TV signals.

Synchronizing signals are used for the control of the computer and the marker signal. The computer discriminates beginning in each field following by means of vertical synchronizing signal, and the horizontal synchronizing signal triggeres time base generator of the oscilloscope with the delay pulse circuit.

Time base generator begin the sweep by one of horizontal synchronizing signal. Next trigger does not work in the oscilloscope until a sweep time finish. Sweep time determines vertical interval of sampling position.

Delay pulse from the oscilloscope is available for the following items:

1. start pulse of sampling to the computer
2. visible marker-signal to the CRT monitor
3. sample and hold (S/H) pulse

The S/H circuit is used to holding for a short time the video signal during the Analog to Digital conversion by S/H pulse.

For the sampling of two-dimensional data, sampling location is moved to horizontal (X axis) by change of delay time in the oscilloscope continuously.

The storage time of whole data is about 0.3 sec minimum, and the conversion time of one point is 80 μsec, the volume of maximum number of data is 3500 point.

The correction of linearity of the video signals are executed b ythe programming.

The digital image of the liver photo-scintigram is processed by the programming for classification of normal and disease pattern.

1. correction of linearity.
2. smoothing of nine points.
3. measuring profile of the liver.
   a. maximum diameter of the liver height