niques are discussed. At first, by minimizing the weighted expected squared difference in which the weight function is chosen to be signal-to-noise ratio (square root of observed count number), nonlinear normal equation was obtained.

Unfortunately, the problem then becomes very much more difficult mathematically. However, the zeroth order approximate solution of this nonlinear normal equation which may be called nonlinear matched filtering was shown to be a practically useful method of smoothing and enhancement in clinical radioisotope scintigraphy. The other method of treating the noise of scintigram is the logarithmic preoperation method.

Some fluctuative effects in image construction may be realistically modeled as multiplicative processes rather than additive one.

Then, the distribution of statistical fluctuation can be approximated by lognormal law rather than by normal one. The approximate lognormal fluctuation law of count number from constant radionuclide was proved by plotting the data on normal probability sheet.

In such cases, logarithmic preprocessor separates the multiplicative noise from signal and allows conventional smoothing and deconvolution theory to be applied. We applied the averaging and differential operator method of approximate deconvolution after logarithmic operation to observed image matrix. Then the output was raised to an exponential power to restore the effect of the logarithmic operation.

Data Processing of Renogram Using Small Digital Computer

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A study of data processing of ^{131}I Hippuran renogram was performed by a small digital computer, in order to offer various parameters for computer to obtain a precise diagnosis of renal function.

During renography, pulses from the scintillation detectors were recorded on the magnetic tape as a media converter, and stored in the memory of computer. From this stored image, various parameters of renogram were calculated as described below, and the original and logarithmic curves were plotted by a digital plotter. A differential curve was calculated from the original renogram, then by this differential curve Segments A, B and C were decided, and the maximum CPM in the Seg. A and Seg. B and the time to each maximum CPM and the ratio of these maximum CPM were calculated. Each area of these segments and their percentages were calculated.

From the logarithmic curve of renogram, Seg. C was divided into two parts: the initial relatively steep slope (Curve 1) and the secondary gentle slope (Curve 2), and the time to an intersecting point of these two curves was estimated.

The differences of CPM between Curve 1 and Seg. B were considered to be the renal uptake of Hippuran, and this accumulation curve was obtained as an exponential function. These Curves 1, 2 and Accumulation Curve were expressed by the approximate exponential functions and the exponents of these functions were expressed also by the form of the half value time.

CPM due to ^{131}I Hippuran in the non-renal tissues in the field of view of the detector, i.e. blood background formed a relatively large proportion of the standard renogram. It may be valuable, to remove the distortion of the standard renogram curve mixed by blood background.

The authors have developed a method of blood background subtraction including the use of two channels analogue subtraction unit

(Aloka: DLA-N12-187) using ^{131}I RISA. Three scintillation detectors were used, one was positioned over each kidney and one over the back of the chest toward the heart. After complete mixing of RISA in the vascular compartment, a proportional estimate of the blood background in each renal region derived from the RISA measurement was made. And then, each renal Hippuran curve was corrected for this blood background.

The subtracted renogram was obtained as the curve which were derived from the ^{131}I Hippuran solely in the renal parenchyma exclusive of circulated media in the blood stream.

An Automatic Analysis of ^{133}Xe Clearance Curve by Digital Computer

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The methods to calculate the regional cerebral blood flow from ^{133}Xe clearance curves are examined. The first one is hight over area method in which regional cerebral blood flow is calculated from a hight at zero minute, a hight at ten minutes and an area under the clearance curve. The second one is two minutes method in which regional cerebral blood flow is calculated from the slope of logarithmic clearance curve during first two minutes. The third one is two compartmental analysis method in which a clearance curve is simulated to two exponentially decreasing curves, i.e. fast component and slow component, and then regional cerebral blood flow of each component and each relative weight are calculated respectively.

The results of calculation are printed each time. And each clearance curve, simulated curve and logarithmic clearance curve during first two minutes can be displayed on CRT in case of need.

Kinetic Studies of the Kidney by the Use of The Interest Area Renogram

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With a use of a scintillation camera, 4096 channel analyzer with alterneus system, and a magnetic taperecorder in recording and playback, kinetic studies of the kidney in different areas of interest were carried out.

Renal functions were evaluated by the interest area renogram, following intravenous injection of ^{131}I-hippuran 400 μCi, and the renal blood flow was also measured by intravenous administration of Tc^{99m} 6 mCi. The dose of these radioisotope compounds were decided considering various significant factors, such as a size of the area of interest, a length of the accumulating time by alterneus system to obtain a satisfactory image, anatomical-physiological characteristics of