curve.

4) Decision of number of exponential components.

5) Calculation of liver blood flow.

6) Curve fitting evaluation (Index of Performance).

Results are recorded in the paper for high speed line printer at a speed of 7 sec./datum and are figured in the chart for X-Y plotter.

The important characteristic of the present study is its ability to decide the number of mutiexponential components. Physiological and pathological data were obtained from 70 experiments on human subjects. Xe-133 clearance curve from liver would be expressed as three components when liver blood flow shows higher value than 40 ml/100 Gm/min generally. On the other hand, it can be supposed that two components of the clearance curve is shown when the value is decreased in abnormal conditions or various liver diseases.

The fast component is thought to indicate portal flow. However, the slow component would be reflected the combined clearances, suggesting hepatic arterial component and slowest portal component.

In summary, the multistep digital simulation technique is a very useful method on the diagnostic study with Xe-133 clearance curve.

Digital simulation for the process of radioisotope image formation

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Formation of a radioisotope image is a complex process originating from a three-dimensional distribution of a certain radionuclide in a medium and three-dimensional sensitivity and resolving power of an image detector to physical characteristics of a display device and psychophysical characteristics of human visual system.

The digital computer can be used to simulate the radioisotope image formation under close conditions to the actual routines, and thus to clarify the relationship between physical characteristics of the image and intelligibility of the image by human.

The simulation is performed knowing a distribution of a certain radionuclide, and type and physical characteristics of image detectors, then calculating a noiseless image with a certain mathematical manipulation which depends upon the type of the detector, and finally introducing Poissonian noise to the image by means of computer-generated random number. Assuming various radioisotope distribution and image detectors, almost all imaging conditions used in radioisotope scintigraphy can be simulated.

As an example of the simulation, we report IAEA co-ordinated program on "Intercomparison of Computer-assisted Scintigraphic Techniques" in which one of the authors is participating. In this program, 24 simulated phantoms are produced by IAEA each of which has a shape of rotationally symmetry of 100 image cell diameter, and has a hot or cold spot of unknown size in each of 4 quadrants. The phantoms are recorded in a magnetic tape and sent to our institute. We have processed them by various smoothing and refocusing methods and answer positions and size of the hot and cold spots to IAEA.

Thus, various methods of image processing are intercompared in view of the best finding of the spots.