Study of the Scanning Technique

(1) The Positioning of the Body and the Detector

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For obtaining better scintigrams in scintiscanning, we conducted a few basic and clinical experiments and found interesting results which are reorted in this paper.

I) Basic Experiment: we used linear phantoms and compared the information of the upper and lower detectors with the separate sets of information by using these detectors separately.

i) For an organ of more than 5 cm in thickness, it is much better to utilize the addition of the upper and the lower detectors.

ii) A better vertical resolution can be obtained by crossing the focuses of the upper and lower detectors rather than by the isosensitive scan which matches the focuses of these two detectors.

iii) For an organ near the surface, better results can be obtained if a collimator of a longer focal distance is used.

II) Clinical Experiments: we studied the positioning of the body and the detectors for scintiscanning of the brain, liver and pancreas.

i) Brain: The addition method enables to determine the lesion in two direction on the positive side, and has the merit of shortening the scan time. A lesion in the peripheral parts of the base of the brain can be better scanned by Towne's projection of the skull which places the detector with an angle of 30° to 40° to the axis of the body in face-up position.

ii) Liver: the liver is a large organ and therefore it is difficult to place the whole liver within the effective range of resolution in the vertical direction of the collimator by means of a single detector. For this reason, it is necessary to use the addition method of the upper and the lower detector, or to conduct scanning in four directions.

iii) Pancreas: although we obtained a good pancrease scientigrams by the addition method, sometimes the images of the liver and the pancreas overlapped in the scintigrams. In such a case, we may sometimes separate the images of the liver and the pancreas by making the posture of the patient in a semisitting position (20°~40°) and positioning the detector vertically to the axis of the body.

A Simple Method of Image Restoration for Scintigraphy

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Mathematically speaking, observed image is the convolution of the true radioisotope distribution and the point spread function of the collimator used. In our previous report the point spread function was approximated by the 21 × 21 matrix and the convolution integral equation was expressed as the simultaneus algebraic equation which were solved by the iterative approximation method. One of the disadvantage of this method is the considerable time necessary for the computation.

The point spread function could be approximately described by a two-dimensional Gaussian function. Convolution integral equation with Gaussian kernel could be solved by using the exponential of the generalized Laplacian.

To investigate the practical effectiveness of this new image restoration method(differential operator method), a preliminary experiment was conducted using digital scan data of