filters in one and two dimension with various cut off frequency. The cut off frequency of FIR and IIR digital filters shows the same value as 1/29 in case of 1 cm in diameter space occupying lesion and as 2/29 in case of 2 cm in diameter, (29 cm means the diameter of the crystal of the scintillation camera), when the space occupying lesion vanishes in the processed image. This results suggest that the information of space occupying lesion may vanish when the cut off frequency is l/r (l=diameter of space occupying lesion, r= diameter of the scintillation camera).

And the space occupying lesion is clearly visualized in both FIR and IIR filters when the cut off frequency is $\frac{l}{29}\times\frac{6}{5}$, which suggests the optimum cut off frequency may be $\frac{l}{29}\times\frac{6}{5}\sim\frac{l}{29}\times\frac{7}{5}$, because the noise may be maximally removed with passing the adequate information of the space occupying lesion.

Imaging of Positron Emitting Radionuclides by a Gamma Camera and Its Image Processing

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Experimental results are presented of imaging positron emitting radionuclides by a conventional gamma camera attached with an existing parallel multi-hole collimator and of correcting images by an iteration method. When a medium-energy collimator is used for positron annihilation radiations or high energy gamma rays, it results in the point source response of a starlike pattern due to the radiations strongly penetrating septa in the directions along the minimum septal thickness in the array of holes of the collimator. The point source response, therefore, consists of mainly two components: one is the sharp component due not to the penetration and the other the broad component due to the penetration.

For instance, the fractions of the sharp and broad component are about 0.37 and 0.63, respectively, with the collimator, which has 1800 holes of 6 mm in diameter by 80 mm long with septal thickness of 2 mm, for a ^{18}F-point source located at 12 cm from the face of collimator. Relative count density in the broad component is less than 10% of the peak count density.

The point source response can be corrected to remove the broad component by an iterative method (see 23). The third iteration with a filter derived from the point source response results in the corrected point source response with the reduced broad component less than 2% of the peak count density.

Detection Limit of Lesions in Section Scintigraphy

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In the computed transverse axial emission tomography, reconstructed images are often associated with appreciable amount of noise due to limited dose of activity given to a patient and finite counting time. This paper presents an expression suitable to evaluate the amount of noise for a given activity distribution.

In the image reconstruction with the one-dimensional convolution method, the observed projections are corrected by taking a convolution with a certain correction function, $g(s)$, and these corrected projections are back-projected to a reconstruction plane. It can be shown that the variance $V(\bar{r}_1)$ of the noise associated with the reconstructed image is given by the convolution of the activity distribution $a(\bar{r})$ with a function $N(|\bar{r}-\bar{r}_1|)$, where $N(r)$ is given by

$$N(r)=\frac{1}{2\pi}\int_0^{2\pi} g^2\,(r\sin\omega)\,\mathrm{d}\,\omega$$

The function $N(|\bar{r}-\bar{r}|)$ is named here "error