3.5 cm in thickness. In the diverging mode, the useful field of view are 27 cm at the surface and 35 cm at 10 cm from the surface. In the converging mode, those are 19 and 13 cm respectively.

The physical characteristics of new collimator were compared with 4000 hole parallel-hole collimeter, middle-energy diverging collimator and pinhole collimator (ϕ=4.6, 3.2 mm). The middle-energy diverging collimator has a useful field of view at the surface of 28 cm, 1200 circular holes and 60 cm focal length.

The values of count density (counts/cm^2), measured with ^{99m}Tc and normalized to the 4000 hole parallel collimator, were 2.26, 1.57, 0.91 and 0.27 for the diverging mode of new collimator, converging mode, middle-energy diverging collimator and 4.6 mm pinhole collimator, respectively.

The uniformity and the linearity in the both mode were good on the useful field.

MTF and FWHM were obtained from the measured line spread function for ^{99m}Tc at the collimator to object distance from 0 to 20 cm in air. In the converging mode, spatial resolution of the new collimator was superior to the 4000 hole parallel collimator at the collimator to object distance from 0 to 13 cm but inferior at the other distance, and inferior to the two pinhole collimators at the all distance. In the diverging mode, it was superior to the middle-energy diverging collimator at the distance from 0 to about 5 cm but inferior at the other distance. However, in the compariosn of the data on the useful field of view, the new collimator was superior to the middle-energy diverging collimator.

Experimental Studies of Div-Con Collimator for Low Energy Gamma-Ray

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Purpose

The fundamental characteristics of Div-Con collimator for low energy, as sensitivity, resolution and distortion for RI distribution in tissue equivalent material are compared with collimator, used generally, using Tc-99m.

Method

The collimators of high resolution parallel hole, pin hole and Div-Con were used for following experiments.

1. Distortion. The spiral phantom of polyethylene tube of 2 mmϕ contained radioactive source was used to measure the source distances.

2. Sensitivity. The relations of collimator-source distance and counts per minute were obtained using the phantoms of kidney and thyroid.

3. Resolution. The intensities distribution of polyethylene tube phantom of 1 mm ϕ contained radioactive source were measured and then the resolutions were calculated from them using Fourier transformation.

Result

1. Distortion. Div-Con Collimator is almost similar to high resolution one. They can be used convertibly for clinical purposes.

2. Sensitivity. For the use of converging, the

deeper in phamtom, the higher sensitivity ratio was obtained compare with high resolution parallel hole collimator and the ratio becomes about two times at the depth of 4 cm. For the use of diverging, there is no difference at shallow region, but the sensitivity ratio decreases with depth gradually.

3. Resolution. For the use of conversing, the resolution is inferior to pin hole, but is similar or superior to high resolution paralel collimator. For the use of diversing the resolution is poor.

In conclusion, the use as converging collimator is profitable to the magnification of small part of kidney, brain and bone and the inspection of child's liver and dynamics.

A New Collimator for Scintillation Imaging

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Lead (Pb) has been mostly used in making collimators for scintillation imaging so far. We planned the use of mercury (Hg) instead of Pb as a wall material, since Hg has higher density than Pb, and therefore the thickness of the collimator wall can be reduced. The half thickness for Hg was 0.2 mm and that for Pb was 0.26 mm against the 140 KeV gamma ray of ^{99m}Tc.

At first, we used the wood of matches (2.8×2.8 mm^2) in the place of hole, and Hg was filled in the gap as a wall material (0.8–1.2 mm thick). For the second Hg collimator, plastic pipes (1.75 mm diameter) and Hg wall (0.375 mm thick) were used. The first collimator was a converging collimator having its focus at 46 cm, and the second one was a parallel hole collimator. The height of the Hg wall of these collimators was 25 mm.

The resolution was 8 mm with the first, and it was 5 mm with the second collimator. The better resolution was expected by increasing the wall thickness and by reducing the diameter of the pipe by the further experiment.

The mass production of sharper and cheaper collimator without sacrificing the sensitivity can be done using Hg and iron pipe.