Experience on Clinical Application of a PH/GAMMA Divcon Collimator for Children

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In the various kinds of the nuclear medicine examination which have been operating for the children from new born baby to the student of almost adult age, we have been experienced in the inexpedient on use of PH/GAMMA Camera equipped with conventional parallel collimator as it is reqired diverging techniques for new born baby, examination due to its extremely tiny body, and converging techniques were required on the examination for the student with larger body.

The problems mentioned above were solved by an adoption of PH/GAMMA Divcon collimator which is available for way on converging and diverging techiniques in any aize.

The resolution and the sensitivity in converging and diverging mode of the Divcon Collimator were also evaluated in comparison with conventional 140 KeV high resolution collimator.

Divcon Collimator has almost same thikness to a 140 KeV high resolution collimator, however, there is some different way in use.

Both of converging and diverging mode are capable in using properly either of both side of Divcon Collimator by mean of turning it over on the detector. Further evaluation with respect to diverging ratio, converging ratio, resolution and sensitivity compared to a 140 KeV high resolution collimator was made through the phantom utilization.

As a result of the evaluation which the Divcon Collimator was used for clinical study practically after the basic experiment, a conclusion was provided that Divcon Collimator could be very much profitable for the children examination.

Clinical Uses of a Converging Collimator with a Short-focus

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The improved resolution of images is attainable through the image magnification by means of a pin-hole or a converging collimator.

A 1800-hole converging collimator with a focal distance of 38cm was constructed and compared to the standard multi-hole collimator and pin-

hole. The image characteristics of the converging collimator were investigated for a Toshiba scintillation camera utilizing a 15-1/4 in.-diameter NaI crystal.

The field of view of the converging collimator decreased with increasing the distance while that of a pin-hole increased. The magnification of images was observed by increasing the object-to-collimator distance, producing the image distortion. The response for the plane sources was not so changed with the distance. A bar-phantom display obtained with Co-57 showed the distinct separation of the 6.3 cm bars at 10 cm and 9.5 cm ones at 15 cm. The improvement in resolution was observed in the selected clinical images, for instance, of the deep-seated lesion in the brain and of third or forth ventricle in the cysternogram. However, the magnification of images of the converging collimator was reverse to that of the pin-hole with regard to the object-to-collimator distance, suggesting the requirment of different practices for the interpretation of clinical images.

High Sensitivity Imaging by a Rotating Slit Collimator

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With conventional pin-hole or multi-parallel-hole collimators, high resolution is attained at the cost of detection sensitivity, and accordingly a collimator suitable for the detection of small lesions yields low signal to noise ratio in the detection of larger lesions unnecessarily. This paper presents a new method of imaging which has a better compromise between sensitivity and resolution than the conventional one. Instead of a pin-hole collimator, a rotating slit aperture of a certain length is placed between an image detector and an object, and, for every count, a line image representing the probability distribution of the source position is displayed on a CRT or stored on an image memory of a computer. The line image corresponds to the projection of the slit aperture onto the object plane from the point of detection. A point source is recognized as the crossing point of a number of the lines. The counting rate increases with the increase of the slit length while the resolution is kept fairly high. A theoretical consideration and a computer simulation showed that the signal to noise ratio in the detection of lesions in a large background organ increases with the increase of the slit length, but the use of a too long slit tends to blur the obtained image. The length of the slit should be such that the length of the displayed line is of the same order of the size of the largest lesions to be recognized.

Tomographic effect is expected by off-center rotation of the slit aperture. Similar imaging can be realized by rotating a multi-parallel-slit collimator in front of an image detector.