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A STUDY OF THE DECORDING OF MULTIPLE PINHOLE CODED APERTURE RI TOMOGRAPHIC IMAGES.

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The authors constructed a Multiple Pinhole Coded Aperture(MPCA) and developed lelated decoding software. When simple coordinate transformation was performed, missing coordinate points and shfting of counts occurred. While observing the tomographic plane and collecting counts at various depth on the Shadowgram, a solution to this problem was found. The counts from the central portion of the tomographic image from the MPCA were incorrectly high, this was rectified by a correction function to improve the uniformity correction program of the γ-camera. Depth resolution of the tomographic image improved in proportion to the area encompassed by the pinhole configuration. An MPCA with a uniform arrangement of pinholes (e,g, pinholes in an arrangement parallel to the X-axis or the Y-axis) yielded decoded tomographic images of inferior quality. Optimum result were obtained with a ring-shaped arrangement yielding clinically applicable tomographic images even for large objects(Lung, Liver and Brain).

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EVALUATION OF SCINTILLATION CAMERA BY SPHERICAL LESION DETECTABILITY.

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The lesion detectability with a scintillation camera as a function of count density was determined for the four spherical cold lesions with diameter 0.9-2.5 cm within a uniform background activity. It can be seen from the curves that the lesion detectability increases with an increase in count density untill 2 kcounts/cm^2, however it does not appreciably improve for count densities above 2 kcounts/cm^2. The curves also show that a giving count density, the lesion detectability decreases as the lesion size or object contrast decreases. The photon-deficient images were evaluated visually by three observers having two or more years experience in nuclear medicine whether or not he could see the lesions. The observer was required to select one of four levels of confidence ((4)-(1)) to represent his judgment: (4) confidence that a lesion is present approaches 100 %, (3) confidence approaches 75 %, (2) confidence approaches 50 %, (1) he has minimum confidence (approximately 0 %).

Signal to noise ratio (S/N) defined by Eq. 1 was calculated to examine the relation between the physical (S/N) and visual performances on the photon-deficient images:

$$\frac{S}{N} = \frac{B \times Co \times Ec}{\sqrt{B}\ \text{(background count density)}} = Co \times \sqrt{B} \times Ec \quad (Eq.1)$$

Co: contrast, Ec: contrast efficiency

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EVALUATION OF LESION DETECTABILITY FOR ^{67}Ga MULTI-WINDOW IMAGING.

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The purpose of this study is to gain the optimum parameter for designing collimator for 67Ga. The flow of study is as follows:
(1) The geometrical resolution(FWHM) and plane sensitivity(cpm/uCi) of 200KeV- and 400 KeV-collimator for 67Ga, is calculated.
(2) Several physical parameters which express the lesion detectability, are calculated for 11 camera-collimator-system having various system resolution and sensitivity.
(3) Using a digital computer, 200 simulated images containing from only one from four defects of various sizes and depths are made and displayed on a micro-dot imager unit. Twenty persons are asked to see X-ray film of the 200 images and to jude whether or not ther are defects in the images using five confidence level.
(4) From the results of their answer, the performance of 67Ga multi-window imaging is evaluated as a measure of human detectability of the defect.
Result:
(1) We conclude that the correllation of signal-to-noise ratio of images and confidence level of answer is liner, but the deviation is large.
(2) 67Ga-multi-window imaging is superior to single window imaging in lesion detectability.

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PRELIMINARY STUDY OF γ-CBF MEASUREMENT BY Xe-133 INHALATION METHOD USING SCINTILLATION CAMERA EQUIPPED WITH A HOMEMADE COLLIMATOR.

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The ultra high sensitive collimator for a scintillation camera was designed to evaluate the γ-CBF with the method of Xe-133 inhalation. This collimator has 121 square holes (11 x 11 holes), 18 mm in inside diameter and 70 mm in length, which are formal by combined septums of 1 mm (Al) + 1 mm (Pb). FWHMs of the collimator were 20 mm, 26 mm, 32 mm, 36 mm and 44 mm at each distance of 1 cm, 3 cm, 5 cm, 7 cm and 10 cm from collimator, respectively. The sensitivity of this collimator was 18 times higher than that of high sensitive conventional one. We can record good time-activity curves from a head after the inhalation of 4 mCi of Xe-133. These results promised us to enable the measurement of γ-CBF by Xe-133 inhalation using the scintillation camera equipped with this collimator.