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CLINICAL EVALUATION FOR OPPOSED LARGE RECTANGULAR DIGITAL GAMMA CAMERA.

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From April 1983, digital gamma camera with two opposed large rectangular detector which was manufactured for trial has been using clinically.
For whole body imaging and ECT,the digital data are obtained with a high degree of efficiency by the computer. By this camera both anterior and posterior images were acquired simultaneously and a half rotation of the gantry is enough for ECT, so the time of imaging was reduced to a half of usual. Additionally the large rectangular detector images and the accuracy of calculation is equal among each images.

We would like to show the cases of clinical trial.

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A STUDY OF ECT γ-CAMERA HEAD TILT CORRECTION USING A RADIAL LINE SOURCE PHANTOM.

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The quality,resolution,etc. of axial tomographic images made by an ECT (emission CT) γ-camera are affected by the horizontal and vertical tilt of the detector head with respect to its axis of rotation. This is particularly true in the case of reconstruction sagital and coronal images where the slightest tilt of the head's axis of rotation greatly affects image quality. Eight line sources(LS),20cm x 2mm x 2mm,were arranged radially at 45° intervals on an acrylic plate 5mm thick. At a right angle to the center of this plate,a phantom was placed on an identical LS plate. 99m-Tc was then placed in the phantom, the assembly set up near the axis of rotation,and a tomograph made. The LSF(line spread function) of the reconstructed image in each direction was examined and the camera head tilt was easily corrected by examining the shape of the LSF. The forward and backward tilt was corrected by examining the lack of focus of the sagital and coronal radial LS images and the lack of focus of the axis of rotation LS;the left and right tilt was corrcted by examining the lack of focus of the axis of rotation LS. In addition to correcting the detector head tilt, the modulation transfer function and image quality of each transverse,sagital and coronal image made by tilting the head were also examined and the results reported.

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DEVELOPMENT OF THE NEW PHANTOM FOR EVALUATION OF SPECT PERFORMANCE.

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We developed a new phantom designed to evaluate the SPECT system performances of rotational gamma cameras. The phantom is composed of 5 parts, and each of them has its own purpose; such as measurements of spatial resolution,slice thickness,dose linearity,uniformity, and image distortion. These parts are made of Acrylic (0.8 cm in thickness),and each of them has the same disc-shape,measuring 28.4 cm in inner diameter and 7 cm in inner length. For the large field of view cameras,it is possible to set up-to 4 parts together if necessary. Therefore,4 different parameters can be obtained at one rotation. The phantom was filled with Tc-99m,and SPECT data were obtained as follows: for the determination of spatial resolution and slice thickness,128 linear sampling with every 5° angular rotation was performed, and 64 linear sampling with every 10° angular rotation for dose linearity,uniformity, and image distortion. The values obtained with the phantom were FWHM of 19.1 mm for spatial resolution,FWHM of 19.9 mm for slice thickness, and integral uniformity of 36.4%. For dose linearity a good correlation (r=0.99) was obtained. We found that this phantom was a suitable tool as a routine quality control and daily maintenance of SPECT system.

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FUNDAMENTAL STUDY OF GATED BLOOD POOL EMISSION COMPUTED TOMOGRAPHY.

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Cardiac functional imaging for planar images reconstructed from gated blood pool ECT were investigated. Two opposed gamma cameras rotated over 360 degrees to collect 60 projection data. Each cardiac cycle was divided into 14 frames and acquisition time of 5, 10 and 15 seconds/step was studies. Gated planar images with least mutual super imposition of cardiac chambers were reconstructed from arbitary axial oblique tomograms obtained from a series of gated transaxial tomograms.

Even with 5 seconds/step acquisition, the quality of the gated reconstructed planar images, the phase and amplitude functional images is quiet good. In a patient with inferior myocardial infarction, although a conventional phase image revealed no abnormal finding, the one of gated planar images reconstructed from sagittal sections showed the restricted phase delay at the inferior region.

It is concluded that if processing time could be more short, this method would be clinically useful for the evaluation of cardiac functions.