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EXAMINATION OF FUNDAMENTAL EFFICIENCY OF TOMOMATIC 64ECT

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The quantitative mesurement of cerebral blood flow is important in the diagnosis and treatment of cerebrovascular diseases. We performed phantom experiments to reveal the fundamental efficiency of Tomomatic 64 ECT. The results were as follows: 1)spatial resolution: peripheral-11mm, central-16mm. 2) slice thickness: peripheral-17mm, central-20mm. 3) sensitivity: 9.7Kcps/uCi/ml. 4) So-called size dependence was present. 5) Relative counts changed according to the change of the value of filter function and attenuation ciefficient. 6) Virtual image eas mixed with ECT image.

Based on these results, we plan to improve such points as follows: 1) improvement of collimeter. 2) improvement of data asmpling interval. 3) improvement of method for reconstruction.

We also performed fundamental study of activation. Xe-133 in the brain washed out wxponentially. 30 min after mesurement reltive counts reduced to 6%. So it became clear that the period between first and second mesurements needs at least 30 min. In the activation study, one of the most important points was, what kind of stimuli we should use.

One of the merits of this machine is that we can easily perform activation study.

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A RECONSTRUCTION ALGORITHM FOR SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY.

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A new method of convolutional image reconstruction for single photon emission computed tomography is presented. The method is basically a filtered backprojection with some modifications. The algorithm consists of three steps: normalization of observed projections, modified convolution, and weighted backprojection. This method provides perfect attenuation compensation for a uniform attenuation medium, but the effect of non-uniform attenuation medium surrounding the radioactive region can be properly corrected. The relative contributions of two conjuage projections can be controled by the reconstruction parameters so that the statistical noise in the image is substantially low. The method enables to form an image with larger weight to the front view than to the rear view, which will result in some improvement in signal-to-noise ration, true-to-scatter ratio and spatial resolution at off-center area of the image, as compared to the conventional method using the average of the two conjugate views.

Simulation studies indicate that the method provides satisfactory images for extended source of Tc-99m($\mu = 0.15$ cm^{-1}) having diameter of up to 35 cm.

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EVALUATION OF VARIOUS DISPLAY METHODS OF SINGLE PHOTON EMISSION CT ---DEVELOPMENT OF 3-DIMENTIONAL OBSERVATION USING MOVING DISPLAY.---

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Single photon emission CT (SPECT) using rotating gamma camera provides us three dimentional distribution of radiopharmaceuticals in targent organs. We developed several display methods of SPECT images including frontal, sagittal and arbitrary axis plane images, using brightness variable display unit attached to X-ray CT, which have been applied to routine examinations with usefulness. In this study we have developed the following three methods to display SPECT images for the purpose of easy recognition of 3-dimentional informations and the usefulness of the methods were evaluated. (1) Moving display of multi-projectional raw images for SPECT reconstruction, (2) moving display of the serial transaxial SPECT images on the same matrix location, (3) moving display of the perspectively converted images of transaxial and frontal images in consideration of the anatomical depth.

These moving display of the SPECT images led us to easier 3-dimentional recognition of the localization of lesions and the shape of organs.

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A NEW CORRECTION MATRIX METHOD FOR SINGLE PHOTON EMISSION CT.

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The single photon emission computed tomography (SPECT), which images the distribution of radio isotope's activity, is efficient technique in the field of nuclear medicine. However, when we measure the activity of R.I., there are many difficult problems such as attenuation of R.I. for the sake of surrounding media.

The proposed method in this paper is based on L.T.Chang's correction matrix method fundamentally. The difference between our method and Chang's that is the consideration of distribution of attenuation coefficient in the media.

The results of computer simulation show the effectiviness of our method so we perform clinical experiments to prove this method's efficasy. The results of experiments suggest the efficiency of our method. However, the reconstructed image after image processing is not so much clear because of ill condition such as movement of patient, statistical variance, flow of R.I. source and insufficient number of projection.