A-2: Instrumentation, Computer Analysis and Data Processing (RCT)

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EXPERIENCE OF RCT BASED ON SCINTIPAC-200 SYSTEM.

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Recently single photon RCT images have been obtained by various methods. We have tried to produce tomographic images using LFOV gamma camera and scintipac-200 without any additional items to our routine nuclear medicine facilities. 36 sequential images were obtained rotating the patient by 10 degrees each time. The data were collected in a disk and were used for reconstruction of RCT images by convolution method using BASIC language. The center of the rotation was estimated based on the collected data. Absorption correction was made calculating geometrical average of two images viewes from the opposite directions. In order to utilize relatively short spare time of the computer, the programm was devided into several segments so that a part of a image could be reconstructed individually. A complete RCT image was finally obtained by the composition of devided images. Tomographic images of any direction plane can be obtained by the recollection of transaxial tomographic images. The method was successfully applied to a phantom and clinically to images of the liver , lung and cardiac pool.

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LIVER VOLUME ESTIMATION FROM RCT IMAGES.

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Since last year, we have been tring Radionuclide Computed Tomography (RCT) using a conventional gamma camera (Ohio Nuclear Σ 410 S) and a rotating chair. This is to report our recent trial of organ volume estimation, especially the liver.

For this purpose, all the slices were obtained at first, then, the margin of each slice was determined by non-linear filtering technique. Finally, the volume was obtained by multiplying the volume of one pixel in a slice by the total number of the pixels within all the slices. Before clinical application, accuracy of this method was determined using the Alderson liver phantom and cylindrical phantom which were filled with Tc-99m solution, and the cut-level was found to be best fitted at 50% with the true volume. On the other hand, however, cut-levels around 30% were best when it was applied to 11 patients having clinically normal liver.

Although further investigation is necessary, this method seems to be very useful for the clinical study of the liver.

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THE STUDY OF CALUCULATION OF LIVER VOLUME BY EMISSION COMPUTED TOMOGRAPHY.

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The determination of liver volume is difficult because of its complicated configurations and deformities. Various radiographic methods have been used but these have not accepted generally.

We have attempted to caluculate liver volume using emission computed tomography(ECT).

For the measurement of liver volume, it is most important to detect the real edge of the liver in each transaxial tomographic image. At first, in order to evaluate the condition for the best fitting, the study using various-sized liver phantom was undertaken. In this study, we used %-cut off method with or without V-filter processing to detect the edge. Also affection of the respiratory movement of liver was evaluated.

In phantom study, caluculated liver volume with 45 % cut-off value showed best fitting to the measured volume of phantom.

This method to caluculate liver volume was thought to be useful for clinical application, for example, to estimate the increase of liver volume after partial lobectomy.

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MEASUREMENT OF ORGAN VOLUME BY ECT USING GAMMA CAMERA.

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In radioisotope studies, an organ volume is usually calculated from the area and length of the organ scintigrams in frontal and lateral views obtained the conventional two-dimensional imaging. In this method, the determination of an accurate organ volume is difficult for the organ of complicated configuration. In a phantom study using ECT, we have attempted to measure an organ volume and up-take ratio of the radioisotope between a pair of two organ such as the liver and spleen, and so on.

In this study, we used a LFOV gamma camera by Searle Co., a Simis-3 computer by Informatek Co., and a rotating chair which we devised and constructed. Emission profile data, obtained for 40 equiangular projections around 360 by rotating the phantom in front of a gamma camera, were used to reconstruct multiple-level emission transaxial images with each slice of about 6 mm in thickness. Delineation of the organ contour in each transaxial slice was obtained using a cut-off and differential method. The organ volume in each slice was obtained by multiplying the organ area by the thickness of the slice. The total organ volume was obtained by summing the organ volume of all slices.

With this method, good correlation was obtained between the true and calculated volumes of various organ in a phantom.