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EVALUTION OF THE PATIENT MONITORING IN POSITRON EMISSION TOMOGRAPHY.

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The value of the dynamic studies is obvious in radioisotope imaging, but problem is it requires a long scan time. Since patient often moves during scans, it influence on an attenuation correction for emission scans, and reconstructed images have significent errors. The effects of movement in emission scans were investigated using phantom studies. It was found that >40% errors in the image can be introduced by 2.0cm shift in phantome position. But amount of errors is affected by duration of movement during scan. It was found that the errors were less than 10% when the time of movement was 10% of the scan time. So means to watch patient should be used. We introduced the patient monitor using commercially available video sensor and LED put on patient's head. Reliability of the patient monitor was tested at brain studies. Deviation can be kept within the range of 2-3mm. The patient monitor seems to be useful to catch the deviation quickly and get images of high reliability.

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AXIAL RESOLUTION AND THE VALUE OF INTERPOLATING SCAN IN MULTISLICE POSITRON COMPUTED TOMOGRAPHY.

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We have calculated the aperture function of a positron computed tomograph (PCT) by computer simulation and evaluated the axial resolution of a multislice PCT, Positologica III both theoretically and experimentally. The axial point spread function (PSF) was approximately a triangle at or near the center of the field and the sensitivity decreased significantly as the source moved away off the image plane. Accordingly activities in the intermediate region between an in-plane and the adjacent cross-plane may not be virtually measured in either slice. In experiments using a myocardial phantom, the "inferior wall" actually disappeared or a small myocardial defect could not be detected when dropped into the gap between slices. In clinical myocardial scan with N-13 ammonia in a normal volunteer, a false positive defect appeared in the inferior wall. These results have suggested that the invisible regions between slices are clinically significant if the object is thin enough in z-axis. In order to fill up the gap between slices, it is valuable to move the patient half the slice interval in z-axis and perform an "interpolating scan".

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ARTIFACTS AND DISTORTIONS IN SAGITTAL TOMOGRAMS RECONSTRUCTED FROM MULTISLICE TRANSAXIAL COMPUTED TOMOGRAMS.

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Sagittal or oblique-angle tomograms can be reconstructed three-dimensionally from multislice transaxial tomograms either in SPECT or PCT. However, those rebinned images may have artifacts and distortions when the resolution and the sampling interval in z-axis differ from those in x- or y-axis in the original images. We have evaluated these effects with computer simulation assuming linear relationship between the activities in the objects and the pixel values in the images. If statistical noise is disregarded, the value at pixel(i,j,k) is expressed as

$$\iiint P_{i,j,k}(x_i-x, y_j-y, z_k-z)\,F(x,y,z)\,dxdydz$$

where $F(x,y,z)$ denotes the distribution of radioactivities and $P_{i,j,k}(x_i-x, y_j-y, z_k-z)$ denotes the point spread function defined as the value at pixel (i,j,k) when a point source of unit activity exists at (x,y,z). The point (x_i, y_j, z_k) corresponds to the center of pixel (i,j,k). We have adopted as F(x,y,z) a spherical shell simulating the left ventricular wall. We have used measured values as the parameters of PSF.

The results of our simulation have suggested that in PCT coarser sampling in z-axis than in xy-axes causes striped artifacts in rebinned images.

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PERFORMANCE EVALUATION OF POSITRON CT DEVICE "SHIMADZU SET 130W".

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The performances of positron CT device "Shimadzu SET 130W" were evaluated. It has three detector rings and five slices can be obtained simultaneously. Each ring has 160 BGO detectors (13.4 x 25 x 30 mm). The collimator systems for brain consist of SNA (standard) and RNA (high resolution). The results were follows.

1. Spacial resolution in the center of the image field

a) radial FWHM (mm)

	direct plane	inter plane
SNA	8.2	8.2
RNA	6.6	6.5

b) tangential FWHM (mm)

	direct plane	inter plane
SNA	8.6	8.2
RNA	6.2	6.8

2. Slice thickness in the center of the image field (FWHM, mm)

	direct plane 1	inter plane 2	direct plane 3
SNA	13.1	13.0	14.6

3. Sensitivity (kcps/μCi/ml)

	direct plane 1	inter plane 2	direct plane 3
SNA	44	87	53
RNA	29	58	34