EVALUATION OF RIGHT AND LEFT VENTRICULAR VOLUMES AND VALVULAR REGURGITATION BY GATED SPECT

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For the evaluation of right and left (RV & LV) ventricular volume and valvular regurgitation by SPECT, we performed phantom study and clinical studies. Absolute ventricular volumes were calculated by threshold method developed by us. In phantom study optimal threshold (OT) level had linear correlation with background (BG); that was $OT = 0.47BG + 44.2%$ $(r=0.99)$. Using this equation, end-diastolic and end-systolic volumes of RV and LV were calculated.

There were good correlation of LV volumes obtained by SPECT and left ventriculography (LVG). The sensitivity and specificity for the diagnosis of regurgitation was 95% and 100% by SPECT and 76% and 95% by LVG. In conclusion, our method of ventricular volume measurement by gated SPECT is reliable and useful not only for calculation of absolute ventricular volume but also for evaluation of valvular regurgitation.

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DETERMINATION OF RIGHT AND LEFT VENTRICULAR VOLUME BY SINGLE-PHOTON EMISSION COMPUTED TOMOGRAPHY.


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Right ventricular and left ventricular volumes (RV and LV) were measured by ECG gated Single-Photon Emission Computed Tomography (SPECT). Ventricular volumes were calculated from serial vertical long axial slices by counting the number of voxels within the ventricle and multiplying them by the known volume of a voxel. From phantom studies, the voxels containing more than 45% of maximum ventricular counts were used as the ventricle. Volumes and ejection fractions (EF) calculated from SPECT were compared with these from contrast angiography. There were significant good correlations between the result of SPECT and contrast angiography. The difference between RV volume and LV volume measured by SPECT was examined. Both RV and LV volumes and end-systolic volumes were significantly greater than these of LV. But EF was significantly lower in RV. It was concluded that SPECT was useful for estimation of ventricular volumes.

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THE ERROR OF 180° DATA COLLECTION AND RADIO-ISOTOPE (RI) DECAY CORRECTION IN CARDIAC BLOOD POOL SCANNING USING SPECT.


In cardiac blood pool scanning using SPECT, the decay and half life-180° data collection (HD) vs full 360° data collection (FD) are problems. In our results of 6 patients, the half-life of Tc-99m labeled albumin in blood varied from 2-4 hr (1.03 ± 0.59 hr, mean ± s.d.). Using a program for RI decay correction, we studied the change in the ejection fraction (EC), (end-diastolic count - end-systolic count) of both ventricles and regurgitant fraction (RF) (1 - RVV/LEVC) in 11 cases. When RI decay correction was performed using a half-life of 3.0 hr, LVEC increased 7.3%, RVVC increased 8.7% and RF decreased 0.9% on the average in HD scans of 8 cases (LPO to RAO, 32 views, 60 ms/1 view), while LVEC and RVVC increased by 6-8%, and RF changed 0.2-3% in 32 view-FD scans of 3 cases. We also studied the change produced by altering the starting position of data sampling in HD scans. In our results of 3 cases, the peak LVEC and RVVC were obtained when sampling was started between LPO 45° and 67.5°. The smaller the LPO angle was, the larger the RF was. The change in RF was 1-4% with 45° - 67.5° LPO starting points and 5-8% when LPO 22.5° - 90° LPO starting position were used.

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QUANTITATIVE ANALYSIS OF THE REGIONAL WALL MOTION BY PHASE ANALYSIS USING BLOOD POOL EMISSION COMPUTED TOMOGRAPHY (BPECT).


The quantitative analysis of regional wall motion by phase analysis applied to gated blood pool ECT was tried in this study. In the sagittal section in the middle of the left ventricle, the amplitude (AaF) and peak ejection rate (PFR) in the anterior and inferior portions were respectively calculated. And inferior-anterior ratio (I/A) of AaF and PFR were also estimated. I/A of AaF and PFR had a good correlation with one of the % radial shortening value (SR%) in the same sections acquired from contrast left ventriculography (RAO 30 deg. view). This method enabled to detect the wall motion abnormalities three dimensionally and to estimate the effect of A-C bypass grafting. And using a cardiac dynamic phantom, the problem of the time resolution power was examined. SPECT end-systolic volume estimated in 100 msec. sampling interval was inferior to one calculated in non gated data acquisition.