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QUANTITATIVE EVALUATION OF PHASE IMAGE.
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ECG gated cardiac studies with phase analysis were performed in 58 patients with various heart diseases, including 30 patients with myocardial infarction (MI). To estimate a distribution of the left ventricular pixel phase values quantitatively, we used a parameter such as one standard deviation (1SD). We studied relation between phase distribution (1SD) and left ventricular ejection fraction (LVEF). The results were follows; 1) A significant difference was found between phase distribution (1SD) of 30 patients with MI and that of 28 patients with non MI. (28.0 ± 13.6 degree versus 8.5 ± 3.0 degree, $p < 0.005$) 2) A significant relation was found between LVEF and phase distribution (1SD). ($r = -0.75$) 3) In 30 patients with MI, a significant relation was not found between LVEF and phase distribution (1SD). ($r = -0.54$) 4) Concerning LVEF, there was no significant difference between antero-lateral MI and infero-posterior MI, while the phase distribution of the former was larger than that of the latter. 5) In patients with MI, a significant relation was found between mean value of region with abnormal wall motion and the regional ejection fraction. ($r = -0.76$)

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EVALUATION OF LEFT VENTLICULAR WALL MOTION AND FUNCTION BY MEANS OF RADIONUCLIDE ANGIOGRAPHY.
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We compared radionuclide angiography (RNAG) with left ventricular contrast angiography (LVCONTAG) in regard to LV wall motion and LV ejection fraction (EF). This study comprised thirty patients with myocardial infarction (N=8), angina pectoris (N=6), cardiomyopathy (N=8) and control (N=8). The first pass RAO angiography was performed in twenty-six patients, and multigated LAO angiography in thirty patients. From RAO and LAO images we calculated LVEF and obtained amplitude images and phase images by Fourier analysis. In addition, we superimposed LV end diastolic isocounter image on LV end systolic isocounter image to detect wall motion abnormality (WMA). This method is highly sensitive to detection of apical WMA in antero-septal myocardial infarction and cardiomyopathy but less sensitive to that of inferior WMA in inferior myocardial infarction. And this method didn't detect WMA of some patients with angina pectoris. In conclusion, we recognized that phase and amplitude images were useful on the detection of LV wall motion. LVEF by multi-gated method is slightly more correlated with that by CONTAG ($r=0.839$) than LVEF by first pass method is ($r=0.767$).

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Right ventricular emptying performance in congenital heart disease assessed by temporal Fourier analysis.
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The right ventricular (RV) emptying performance in patients with various congenital heart diseases was investigated by temporal Fourier analysis of multigated cardiac blood-pool studies on a pixel-by-pixel basis. In 15 normal subjects, the mean values of phase angle of the left ventricle (LV) and RV were -55.4 ± 17.4, -58.9 ± 18.2 degree respectively, and no significant difference between them (-3.5 ± 11.5 degree) was shown. In patients with either ventricular septal defect (VSD) without pulmonary hypertension or RV pressure overload with intact ventricular septum (eg. small VSD, pulmonary stenosis or primary pulmonary hupertension et al.), phase and amplitude of both ventricles ranged within normal limits. By contrast, in patients with VSD associated with severe RV pressure overload, phases of RV were delayed and their differences between RV and LV became significant. This tendency of RV phase lag seemed to be markedly intensified by the presence of RV outflow obstructive lesion (eg. Tetralogy of Fallot).

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A METHOD OF QUANTITATIVE PHASE ANALYSIS FOR CARDIAC CONTRACTION.
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The cardiac function is evaluated by the parameters "phase" and "amplitude" computed from the regional time activity curves by Fourier analysis. The more quantitative method for this analysis was developed in the following three: 1) the phase and amplitude images at the RAO projection obtained by the first pass(FP) method were calculated in addition to the LAO images. 2) the color display of the phase and amplitude images was quantitatively done. 3) the histograms of phase and amplitude in the arbitrary ROI were generated. Although the data by the FP method were statistically poor, the percent root mean square for these analysis was about 15 %,whereas about 10 % for the data by the equilibrium method The useful clinical information was obtained from the RAO image. The relationship between the amplitude and regional ejection fraction(REF) is given in the equation $REF=(2A/C_0)/((1-BG)(1+A/C_0))$, where C_0 is a component of direct current, BG is ratio of background count to end-diastole count. The image of A/C_0 was displayed with 15 color levels corresponding 5 to 75 % of REF. The values of phase for the left ventricle of normal control was estimated from the value at the peak in the histogram. They were found to correlate to R-R interval.