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USEFULNESS OF REGIONAL DIASTOLIC PHASE INDEX BY GATED CARDIAC BLOOD POOL IMAGING IN PATIENTS WITH CORONARY ARTERY DISEASE.

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In order to investigate the usefulness of regional diastolic phase index of the left ventricle (LV) in patients with coronary artery disease (CAD), multigated cardiac blood pool imaging were performed at rest at LAO position. Ten normal subjects and 20 patients with CAD with normal ejection fraction (EF) (≧55%) were studied. LV was divided into 8 segments from the geometric center and regional volume curves were obtained in each of them, and in 5 except for cardiac base following parameters were obtained; 1) ununiformity of regional beginning of ejection (REJ) 2) ununiformity of regional endsystole (RES) 3) regional EF 4) regional filling rate during the first half of rapid filling phase (FR-in-1/2RF). CAD were divided into 2 groups according to the absense (Gr.I) or presence (Gr.II) of previous history of myocardial infarction. Ununiformity of REJ was not different among 3 groups. Ununiformity of RES was significantly ($p<0.01$) greater in Gr.II than that in Normal, but it was not different between Gr.I and Normal. Abnormalities in REF were observed in 20% of Gr.I and 60% of Gr.II. On the contrary, abnormalities in regional FR-in-1/2RF were observed in 80% of Gr.I and 100% of Gr.II, besides abnormalities in regional FR-in-1/2RF made possible the detection of stenosed coronary artery.

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ESTIMATION OF SYSTOLIC AND DIASTORIC FUNCTIONS IN HYPERTROPHIC AND ISCHEMIC HEART DISEASES USING FOURIER ANALYSIS.

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Fourier analysis of gated blood-pool images using higher order harmonics was performed in 79cases to evaluate global and regional cardiac function. Following indexes were obtained:EF(Ejection fraction),PER(Peak ejection rate),TPE(time to PER),TES(time to endsystole),PFR(Peak filling rate),TPF(time to PFR),PFR/PER,TPF/TPE,TES(SD),TPE(SD), and TPF(SD). Patients with ischemic heart disease (IHD) showed significantly lower PFR, longer TPE, and lower tendency of PER than normal group. Patients with hypertrophic heart disease (HCM:Hypertrophic cardiomyopathy, HOCM:Hypertrophic obstructive cardiomyopathy, HHD: Hypertensive heart disease) showed significantly longer TPF, higher PER than normal group. Patients with IHD, HCM and HOCM showed significantly higher TPF(SD) than normal group, suggesting asynchronous relaxation. However, patients with HHD showed normal TPF(SD).

We conclude that Fourier analysis of gated blood-pool images using higher order harmonics provides useful informations of systolic and diastolic properties in ischemic and hypertrophic heart diseases.

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EVALUATION OF A NEWLY DEVELOPED CARDIAC REAL TIME MONITORING SYSTEM FOR MULTI-GATED RADIONUCLIDE ANGIOGRAPHY.

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We developed a new radionuclide angiographic procedure(cardiac real time monitor: CRTM) in order to evaluate serial changes in cardiac function during exercise. BY CRTM, multi-gated images were produced from a minimum of sampling number of 20 cardiac cycles and then hemodynamic parameters such as ejection fraction(EF), end-diastolic and end-systolic counts and heart rate were obtained. To investigate the reliability of LVEF obtained with this new procedure, radionuclide angiography was performed in 11 cases and LVEF was repeatedly calculated from sampling number of 20, 40 and 60 in 600 cardiac cycles. Maximum variance in LVEF(maximum LVEF minus minimum LVEF in each case) for sampling number of 20, 40 and 60 cardiac cycles were 14.1+3%, 7.8+3% and 6.0+2%, respectively. As sampling number of cardiac cycles collected were small, LVEF tended to be higher than that calculated from sampling number of 600 cardiac cycles. These results indicate that collection of even 60 cardiac cycles may not be sufficient to get reliable LVEF probably due to statistical fluctuation caused by low counts acquired. Further improvement to increase count density will be required in order to apply this new procedure to clinical study.

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DEVELOPMENT OF A NEW ACQUISITION TECHNIQUE FOR MULTI GATED IMAGES CONVERSELY SYNCHRONIZED TO R-WAVE APPLYING THE MULTI BUFFER METHOD.

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It is necessary to acquire multi gated images conversely synchronized to R-wave for getting accurate images in phase preceding R-wave, for example diastolic phase or isovolumetric contraction phase.

Usually, for getting multi gated imges conversely synchronized to R-wave, it is necessary to acquire date in list mode and to convert to images consuming much processing time.

Also, in the case of arrhythmia, this method compels us to use memory unefficiently because of the useless data acquisition.

A new technique has been developped that enables us to acquire the multi gated images conversely synchronized to R-wave in image mode at the time of normal multi gated image acquisition simultaneously neglecting the irregular pulses.

"SCINTIPAC-70A" and its high speed image operating unit are used for data processing system and image operation respectively.

The details of this technique and some clinical data will be reported.