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Cardiac Phantom Study on EF Calculation by MUGA and Contrast Left Ventriculography

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There is a clinical agreement on recognition of good correlation between ejection fractions (EF) acquired from multiple gated cardiac blood pool scans (MUGA) and those from contrast left ventriculograms (LVG).
First, contrast cineangiography was performed by using contrast material for the cardiac phantom, and EF was obtained by a single-plane-volume-calculation method with area/length formula. Next, filling 5mCi of Technetium-99m in the same phantom, EF was calculated by the MUGA method. In the MUGA study, threshold level, time smoothing and other factors were optimized so that the best condition was learned to calculate the naerest EF to the true EF. The results showed EFs obtained by the MUGA correlated well with those by LVG. Furthermore, there seemed to be a tendency that the MUGA's EFs were closer to the true EFs than the LVG's.

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NEW ALGORITHMS PROCESSING ATRIAL FIBRILLATION AND DRAWING LEFT VENTRICULAR FUNCTION CURVE BY RADIONUCLIDE VENTRICULOGRAPHY

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Previously we reported a method to apply ECG gated blood pool scintigraphy (GBS) to patients with atrial fibrillation (AF), which enables to construct multiple gated image (MGI) discriminated by preceding R-R intervals (PRR) and to draw left ventricular function curve (LVFC) from the data acquired in list mode. We devised another two algorithms processing GBS data during AF and drawing LVFC. (1)MGI acquisition with PRR discrimination in frame mode, aiming at real-time image composition without list/frame conversion taking time. The real-time method is easy to perform and also derive useful information such as ejection fraction variance as well as LVFC. (2)For the purpose of direct imaging of cardiac cycles initiated with different end-diastolic volume, independently of PRR, MGI is constructed with discrimination of beat-to-beat EDC which is sampled for 60 msec after each R-wave trigger in the LV-ROI. This method will make it possible to apply to patients without AF to draw LVFC.

In conclusion, GBS is well feasible to patients with AF and these new algorithms are useful in simplifying the processing and may extend its appication.

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CLINICAL USEFULNESS OF A GATED BLOOD POOL SCINTIGRAPHY BY SECOND HEART SOUND AND ELECTROCARDIOGRAPHIC R WAVE IN PATIENTS WITH ATRIAL FIBRILLATION.

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A new method was devised for assessing cardiac function in patients with atrial fibrillation (AF). Ejection fraction (EF) was calculated by the summation counts during 1500 heart beats in each 30 msec. interval at both end - diastole and end - systole by means of electrocardiographic R wave and second heart sound gated method.
To determine the reliabillity of the summation counts in patients with AF, phantom study was performed on the basis of the left ventricular volume in patients with AF. EF caliculated by using variable end - diastolic and end - systolic volume was in close agreement with that caliculated by using mean end - diastolic and end - systtolic volume.
EF calculated by using this method correlates well with mean EF in echocardiography.
In conclusion, it was suggested that the EF measured by this method was reliable even in patients with AF.

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USEFULNESS OF FACTOR ANALYSIS IN HEMODYNAMICE STUDIES DURING EXERCISE STRESS TEST.

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For the purpose of evaluating the usefulness of Factor Analysis in hemodynamic studies during exercise stress tests, 10 patients with myocardial infarction and 5 normals were studied by radionuclear and mechanocardiographic methods. The exercise loading was performed by ergometer (0.5 and 1.0 watt/kg intermittently increasing load) in the supine position, and we measured the ejection fraction of the left ventricule according to the multigated method (Tc-99m HSA). We analysed the hemodynamics and cardiac wall motion by Factor Analysis after Di Paola and cardiac Fourier phase analysis and measured systolic time intervals simultaneously.

From this study we conclude that, (1) for studing hemodynamics during exercise stress test it is useful to observe the changes in A-Factor, relating to the activity of the atrium, and V-Factor, relating to the activity of the ventricle, of Factor Analysis, and "unreasonable movement" in the image gained by the analysis, (2) for evaluating the cardiac reserve it is necessary to combine the results of Factor Analysis with cardiac Fourier phase analysis.