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DYNAMIC HEART PHANTOM FOR THE EVALUATION OF THE MULTIGATE METHOD TO MEASURE CARDIAC EJECTION FRACTION.

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A dynamic heart phantom has been developed for the evaluation of multigate method as measuring cardiac ejection fraction (EF). The phantom consists of two diaphragms moulded with silicon rubber and of two ball valves. Air pressure is applied between the diaphragms to get the periodical inner volume change. The pulsed flow is obtained by ball valves placed between the phantom and water bath. The pulse width, rate, and amplitude can be changed to get various volume curve. Using the voltage pulse for driving a electromagnetic three-way stopcock valve as a gate timing signal, we obtained multigate images and calculated the EF in various pulse conditions. When the background activity is negligible, EF obtained by the multigate method has a good correlation with that obtained by the electromagnetic flowmeter, and moreover from the curves of EF against pulse width, multigate method is found more reliable than the electromagnetic flowmeter method. If the background activity is increased, the value of EF obtained from multigate method increases without change of any other parameters. The effect of the presence of descending aorta near the ventricle on the value of EF is negligible unless background ROI includes the aorta.

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A NEW METHOD FOR THE MEASUREMENT OF THE LEFT VENTRICULAR VOLUME BY USING INDIVIDUAL ATTENUATION FACTOR.

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To obtain left ventricular endodiastolic volume (EDV) by RI, new method was developed by using individual attenuation factor (IAF). In 36 healthy subjects, EDV determined by UCG was compared with that by RI to confirm the accuracy of determination of volume by RI. Five ml of saline with Tc-99m, given count of Tc-99m (Co), was filled in a balloon mounted on the tip of catheter (Foley 12 F). The catheter was inserted through esophagus to the level of the 3rd. intercostal space and Tc-99m in the balloon was counted. (Ci) Then the catheter was pulled out. After this, multigated acquisition during which venous blood of 10 ml was sampled and Tc-99m in the blood was counted. EDV by multigated acquisition was computed in the LAO-45° projection by following formula;

$$EDV = \frac{LV \text{ count/sec}}{\text{Blood count/ml} \cdot \text{sec} \times IAF} : IAF = \frac{Ci}{Co}$$

There was a good correlation between EDV by RI and that by UCG. (r=0.88)
Thus this new method of IAF by esophageal balloon is useful for the clinical determination of EDV.

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ESTIMATION OF VALVULAR REGURGITANT VOLUME BY IN VIVO Tc-99m RBC GATED POOL SCAN.

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Estimation of regurgitant volume was performed in 22 cases of aortic and mitral valve regurgitant disease. Left ventricular volume predicted by count method had good correlation (R= 0.962) with that by dye dilution method in non regurgitant disease. The regurgitant volume thought to be the difference between the LV volume by count method and that by dye dilution method in regurgitant disease. Regurgitant volume showed the severity of valvular regurgitation in angiographic score (+1, +2, +3) estimated by contrast angiography. Stroke volume ratio and regurgitation ratio by Rigo's method (Circulation 60, 306, 1979) had good correlation in low angiographic score (+1, +2) but not in high angiographic score (more than +3). In the higher angiographic score, LV volume was undervaluated by clockwise rotation of the heart because of RV hypertrophy.

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EVALUATION OF RIGHT HEART FUNCTION BY SHORT-LIVED RADIONUCLIDE (Kr-81m).

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We developed to evaluate Kr-81m for RV, RA function, especially, for the application for intervention study

- (1) Evaluation of rapid injection effects
RVEF was increased in the rapid injection, while decreased in the slow injection because of incomplete mixing of RI in the right ventricular chamber
- (2) Evaluation of exercise RVEF in CAD
In CAD patients, RVEF from rest to exercise were not significantly decreased, while decline of RVEF increased RVMI with severe stenosis of RCA.
- (3) Evaluation of TR
In patients with valvular heart diseases suspected TR, degree of TR was estimated by the time activity curve of RA, RV. These methods were good agreements with doppler and RV graphy.