

165

DETERMINATION OF LEFT VENTRICULAR EJECTION FRACTION FROM EQUILIBRIUM RADIONUCLIDE VENTRICULOGRAPHY. C.Yamanaka, M.Maki, H.Hara, S.Nara, K.Kusakabe and T.Yamazaki. Department of Radiology, Tokyo Women's Medical College Tokyo.

Evaluation of left ventricular ejection fraction of 15 cardiac cases that underwent both radionuclide and contrast ventriculography was done. 15-20 mCi of Tc-99m human serum albumin was injected intravenously. After homogeneous tracer distribution in the blood pool, the scintillation camera was placed over the heart at 30-60° left anterior oblique angle, to differentiate left and right ventricles and to avoid superimposition of the aorta. The data were processed by the computer. 16-20 frames in one cardiac cycle, each describing one short phase (40-50 msec) of the cardiac cycle, were acquired and cineventriculography created. The left ventricular contour was drawn from the end-diastolic phase, and left pulmonary artery and area lateral to the left ventricle were selected for background subtraction. Left ventricular volume curve and ejection fraction were computed. Ejection fraction obtained from radionuclide and contrast ventriculography correlated well; $r=0.83$, 0.93 , when the background was selected in the pulmonary artery and area lateral to the left ventricle, respectively. We have proved using the artificial heart, that with accurate background correction, a reliable ejection fraction can be obtained.

166

CHANGE AND RATE OF CHANGE OF LEFT VENTRICULAR VOLUME ESTIMATED BY ECG-GATED CARDIAC BLOOD POOL SCINTIGRAPHY. T.Kondo, K.Kaneko, H.Hishida, M.Shigemura, K.Douniwa, N.Funakawa, Y.Sakai, H.Teshigawara, S.Ohashi, M.Wada, Y.Miyagi, M.Nomura, S.Okajima, S.Hisada, Y.Mizuno, A.Takeuchi*, Y.Kawai*, K.Ejiri*, F.Sasaki* and S.Koga*. Dept. of Medicine and Radiology*, Fugita Gakuen Univ. School of Medicine, Toyoake, Aichi470-11, Japan.

To assess the left ventricular (LV) performance in patients (pts) with myocardial infarction (MI), the systolic and early diastolic maximum rate of change of LV volume (SdV/dt and DdV/dt) was evaluated by ECG-gated equilibrium cardiac blood pool scintigraphy. 15 normal subjects and 48 pts with MI were studied. SdV/dt and DdV/dt were corrected by counts corresponding to stroke volume. Influence of the variation of RR intervals on SdV/dt and DdV/dt was considered negligible. SdV/dt and DdV/dt were 6.2 ± 0.3 /sec and 6.1 ± 0.3 /sec in normal, respectively, while those were 6.2 ± 0.1 /sec (N.S.) and 4.3 ± 0.1 /sec ($P < .001$) in MI. DdV/dt were 3.7 ± 0.2 /sec in ant. and inf. MI, 4.5 ± 0.2 /sec in ant.MI, and 4.2 ± 0.3 /sec in inf. MI with a significant difference between the former two ($P < .05$). Although pts with small and large ant. MI, determined by the number of Q waves in chest leads, did not show significantly different values of DdV/dt, pts with a small ant. ischemic area determined by the number of Q waves and/or ischemic ST depression showed a higher DdV/dt (5.2 ± 0.3 /sec, $P < .01$) than pts with a large ant. ischemic area (4.0 ± 0.2 /sec).

In conclusion, DdV/dt was depressed in pts with MI in contrast with unchanged SdV/dt, and was related to the size of infarction and/or ischemic area.

167

THE STUDY OF LEFT VENTRICULAR VOLUME CALCULATIONS: THREE DIMENSIONAL ANALYSIS IN THE SYNCHRONOUS DUAL-CAMERA RECORDING AND ANALYSIS TECHNIQUE. A.Asahara, H.Ueda, S.Wakabayashi, M.Kiri. Central Hospital of J.N.R. and Shimadzu Corporation. Tokyo and Kyoto.

We report the method of the left ventricular volume calculations, basic studies, and clinical applications. New computer programs were developed for the purpose. The method was based on our "Synchronous Dual camera Recording and Analysis Technique", reported at the last annual meeting of JSNM in '78. The manually appointed long axes in left ventricle images of both sides (RAO 30° and LAO 60°) are divided into n to prepare n slice surfaces at the right angle to each long axis. To determine the sizes of slices, the distances from divided point to surrounding edge of ventricle are automatically measured. Then the area of each slice is calculated as the sum of four quarterly oval areas using measured distances. The thickness of the slice is $1/n$ of long axis length calculated from both sides of images. The slice volume is obtained by multiplications of the slice area and its thickness. Totally n slice volumes are summed to a left ventricular volume. The basic studies were done by phantoms in various shapes filled with TC-99m. The results were in conformity with the actual volumes (errors within $\pm 10\%$), when shapes were not so complicate. On clinical applications, the results were satisfactorily good. We reached the conclusion that this method is considered to be used for clinical applications.

168

A SIMPLIFIED METHOD FOR THE DETERMINATION OF CARDIAC INDEX IN PULMONARY VASCULAR DILUTION CURVE. M.Suzuki, S.Yoshimatsu, T.Araki and M.Suwo. Department of Clinical Pathology (Radioisotope Laboratory) and Internal Medicine, Kenritsu Amagasaki Hospital. Amagasaki.

Pulmonary vascular dilution curve (PVDC) consists of two phases; a first pass phase and a phase in steady state of I-131 RISA concentration. Cardiac output (CO) can be calculated by Stewart-Hamilton's dilution method. Since this procedure is complicated and time consuming, an attempt was made to establish a simpler formula by which CO can be more easily calculated. CO was expressed as a ratio of total blood volume (TBV) and mean transit time of whole body (MTTb). Therefore, in the PVDC, an interval time (Tpcf-1.5) between the time when the radioactivity rose to 1.5 time as high as concentration in the steady state and the time when it was reduced to 1.5 times concentration was measured. Correlation between MTTb by radiocardiogram and Tpcf-1.5 was studied. In 54 cases of valvular cardiac diseases without regurgitation, correlation coefficient was 0.889 ($p < 0.01$). MTTb will be obtained as follows.

$$\text{MTTb}(\text{min}) = 93.6 + 77.6 \times \text{Tpcf-1.5} \dots (1)$$

$$\text{Therefore, CO (l/min)} = \text{TBV} / \text{MTTb} \dots (2)$$

$$\text{CI (l/min/m}^2\text{)} = \text{CO} / \text{body surface area} \dots (3)$$

Thus, by measuring Tpcf-1.5, CI was easily estimated using formula (1), (2) and (3). Correlation between the data calculated from this method and the data from Fick's method was very close ($r=0.62$, $n=108$, $p < 0.01$).

These results led to the conclusion that Tpcf-1.5 measurement was very feasible for the calculation of CI in PVDC.