3

VOLUME CURVE ANALYSIS IN PATIENTS WITH CARDIOMYOPATHY.

M.Narita and T.Kurihara. Sumitomo Hospital, Osaka.

To investigate the characteristics of left ventricular (LV) volume curve in patients with cardiomyopathy, cardiac blood pool imaging with Tc-99m was obtained at rest (modified LAO). From LV time activity curve, we obtained LV ejection fraction (EF), mean first third ejection rate (1/3 ERm), peak ejection rate (ERmax), mean first third filling rate (1/3FRm) and peak filling rate (FRmax). From right ventricular (RV) time activity curve, RVEF was calculated.

1) Idiopathic Dilated Cardiomyopathy (DCM): Nine patients with idiopathic DCM and 9 patients with ischemic DCM were compared. LV volume curves did not show any difference between 2 groups (LVEF; 19.6±6.5 %, 19.4±4.1%, respectively). On the other hand, RV volume curves showed disparity in RVEF between 2 groups (23.3±4.7% in idiopathic DCM and 36.6±6.4% in ischemic DCM).

2) Hypertrophic Cardiomyopathy (HCM): LV volume curves which were obtained in patients with HCM (n=22) were compared with those of normal subjects (n=18), patients with hypertension with LV hypertrophy (HT, n=15) and patients with coronary artery disease with normal LVEF (≧55%)(CAD, n=29). (a) Systolic Function; In patients with HCM, all systolic indices (LVEF, 1/3ERm and ERmax) were significantly greater than those of other 3 groups. Besides in HCM group, peak ejection appeared significantly earlier systolic phase than other groups. (b) Diastolic Function; Early diastolic filling (1/3FRm) in HCM was significantly lower than those in normal subjects but was not different from those in HT and CAD groups. In HCM group, peak filling appeared significantly later diastolic phase than normal subjects, but its values (FRmax) were not different significantly from those in normal subjects. On the contrary, both HT and CAD groups showed abnormally low FRmax as well as delay in the appearance of the peak filling.

These characteristics in LV volume curve indicated that in patients with HCM, systolic ejection was exaggerated especially in early systole, but diastolic filling in early phase was impaired and peak filling appeared relatively late without significant impairment in FRmax.

Besides, early diastolic filling (1/3 FRm) was useful for the detection of LV hypertrophy and to evaluate functional impairment in patients with HCM. The study of the effect of nifedipine upon LV volume curves revealed followings; abnormal diastolic LV filling in HCM and HT was faborably modified by nifedipine, but their mechanisms were different. In HT, it was related to improved systolic function due to LV afterload reduction, while in HCM, it was not related to the peripheral hemodynamic effects nor improved systolic function.

---

(3) Recent image diagnosis

1

MYOCARDIAL EMISSION COMPUTED TOMOGRAPHY (SINGLE-PHOTON ECT AND POSITRON TOMOGRAPHY)

N.Tamaki and Y.Yonekura. Kyoto University Medical School, Kyoto.

Cardiac emission computed tomography (ECT) permits three-dimensional evaluation of tracer distribution in the myocardium. ECT has several advantages: high contrast images, better visualization of the lesion and potential capability of quantification. Single-photon ECT (SPECT) using a rotating gamma camera has been widely applied in Japan for thallium-201 myocardial perfusion imaging. Resting thallium-201 SPECT improved diagnostic accuracy for detecting myocardial infarction, and stress SPECT yielded high sensitivity for detecting coronary artery disease and identifying stenosed vessels. However, SPECT has potential limitation due to low sensitivity and inability for true quantification. Ring-type SPECT, which provides 3 slices with high sensitivity enables serial dynamic study of the heart. This ring-type SPECT has been applied for dynamic study of stress thallium-201 myocardial imaging to assess tracer washin and washout from the myocardium.

Positron computed tomography (PCT) has advantages over SPECT for better performance and better qunatification with wide application of natural substrates and their analogues. We have been using a whole-body multislice PCT device (Positologica III). It yields 7 transverse sections which can cover the whole heart at a single scan. Myocardial perfusion imaging was performed after intravenous administration of N-13 ammonia. The high spatial resolution (7.6-8.7 mm in FWHM) of PCT images permits delineation of fine cardiac structures and subtle changes of myocardial perfusion. Resting myocardial imaging detected abnormal perfusion in 18 of the 19 cases (95%) with myocardial infarction. However, cardiac short-axis and long-axis sections were often necessary for better visualization of inferior and posterior regions. The high sensitivity of PCT device (about 30 times higher than rotational SPECT) permits rapid dynamic study of myocardial imaging. Serial 15 second dynamic imaging following N-13 ammonia injection visualized blood-pool in the first scan and left ventricular myocardial images from the 3rd scan. In cases with myocardial infarction and mitral stenosis, the dynamic study demonstrated delayed tracer washout from the lung with prolonged time to peak activity in the myocardium, suggesting pulmonary congestion. To assess coronary artery disease, stress N-13 ammonia myocardial imaging was performed. Stress PCT imaging detected perfusion abnormality in 18 of the 19 cases (95%) of coronary artery disease and identified 30 of the 34 stenosed vessels (88%). PCT enables evaluation of myocardial energy metabolism using C-11 palmitate and F-18 FDG. These metabolic analysis may be valuable for evaluation of myocardial viability as well as metabolic dearrangements of the heart.