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FOURIER ANALYSIS OF LEFT VENTRICULAR VOLUME CURVE DERIVED FROM CARDIAC POOL IMAGING IN PATIENTS WITH ARTIFICIAL VENTRICULAR PACEMAKERS. K.Kondoh,M.Okada,Y.Tanahashi, H.Muramatsu,S.Mizutani,T.Furumichi,K.Kanoh\*, N.Kawai\*,A.Suzuki\*,H.Matsushima\*,A.Satoh\*, R.Katoh\* and I.Sotobata\*.Nagoya Ekisaikai Hospital and \*First Dep. of Intern. Med. Nagoya Univ.,Nagoya.

The purpose of the present study was to evaluate the effects of pacing mode and exercise on left ventricular(LV) volume curve derived from cardiac pool imaging. The subjects consisted of 8 patients with DDD pacemakers and 5 normal controls. LV volume curve was analyzed from the third Fourier harmonics. During supine bicycle ergometer exercise(Ex), LV ejection fraction increased significantly in normal subjects and DDD mode, while unchanged in VVI mode. Diastolic  $dv/dt$  was significantly greater during Ex than at rest in DDD mode(4.2 vs 2.6 EDV/sec, $p < 0.05$ ). However, it showed no significant increase in VVI mode(3.3 vs 3.5,NS). In three patients an increase in ventricular rate from 70 to 110 bpm enhanced diastolic  $dv/dt$  in DDD mode(2.1 to 5.4), but not in VVI mode(3.1 to 4.5).

The present study using Fourier analysis of LV volume curve suggests that DDD pacing is more desirable to support LV function during Ex than VVI mode.

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Mechanism of inspiratory reduction of left ventricular stroke volume in patients with impaired left ventricular function. BH.Kim, Y.Ishida,Y.Tsuneoka,N.Matsubara,H.Takeda, M.Inoue,T.Kamada,Y.Nakamura,Y.Kusumi, K.Kimura,T.Kozuka. Osaka University Medical School, Osaka.

We evaluated the mechanism of the inspiratory reduction of the left ventricular stroke volume (LVSV) in patients (pts) with impaired LV function. Eighteen pts with a variety of LV function underwent the respiratory and ECG gated radionuclide ventriculography and LV volume changes were measured during spontaneous respiration. LVSV decreased during inspiration in all the pts. In nine pts with a  $LVEF > 0.35$ , LV end-diastolic volume (EDV) significantly ( $p < 0.05$ ) decreased from expiration (exp) (159±28 ml) to inspiration (insp) (147±34 ml) without a significant change in LV end-systolic volume (ESV) (exp:82±24 ml, insp:82±29 ml). In contrast, in nine pts with a  $LVEF < 0.35$ , LVEDV was unchanged (exp:211±93 ml, insp:213±89 ml) and LVESV significantly ( $p < 0.001$ ) increased from exp (152±72 ml) to insp (168±89).

These results suggest that the inspiratory reduction of the LVSV is the result of two mechanisms; a decrease in preload and an increase in afterload of the left ventricle. Which mechanism predominantly operates is related to the functional state of the left ventricle.

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EVALUATION OF THE INFLUENCE OF CHANGE IN HEART RATE ON LEFT VENTRICULAR DIASTOLIC FUNCTION INDEX. M.Kimura,T.Yamamoto,I.Odano,K.Sakai,T.Tsuda\*,K.Kodera\*,M.Uruma\*, S.Hayashi\*,K.Watanabe\*,Y.Arai\* and A. Shibata\*.Department of Radiology and \*the First Department of Internal Medicine, Niigata University School of Medicine, Niigata.

In order to assess the influence of change in heart rate on left ventricular diastolic function index, ECG gated cardiac pool study was performed in 6 patients with implanted programmable AAI pacemaker. Heart rate was changed by atrial pacing from 50 to 120 beats/min, every 10 beats/min. The filling fraction during third of diastole (1/3FF), the peak filling rate (PFR), mean first third filling rate (1/3FR-mean) and early filling volume ratio (%EFV), now used as the indices of LV diastolic performance, were assessed. According to increase in heart rate, 1/3FF decreased significantly, PFR were not different between 50 to 80 beats/min, but increased significantly from 90 to 120 beats/min. 1/3FR-mean and %EFV did not change significantly, but 1/3FR-mean showed tendency decreased and %EFV showed tendency increased as the heart rate was increased.

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THE EFFECT OF LEFT VENTRICULAR CONTRACTION ON LEFT ATRIAL FILLING. Kaoru Fujii, Masaharu Ozaki, Hiroyuki Nagano, Kazuhiko Matsumura, Kenji Ishine, Takashi Yamagishi, and Reizou Kusakawa. Yamaguchi Univ., Ube.

The effect of left ventricular(LV) contraction on left atrial(LA) filling was studied in 17 normal subjects and 29 patients with heart disease(without regurgitation or shunt). LV and LA time-activity curves of chamber counts(C) and these first derivatives( $dc/dt$ ) were obtained by using ECG-gated radionuclide angiography. LV peak ejection rate(LV-PER) and LA peak filling rate (LA-PFR) were calculated as follows;  $LV-PER (l/sec) = (LV \text{ systolic maximal } dc/dt) / \text{end-diastolic LV-C}$ ;  $LA-PFR (l/sec) = (\text{maximal } dc/dt \text{ during LA filling phase}) / \text{maximal LA-C}$ . The timing of LV-PER was nearly coincided with that of LA-PFR. LV maximal volume change in LV systole(LV max  $dv/dt$ ) and LA maximal volume change in LA filling phase (LA max  $dv/dt$ ) were calculated as follows;

$LV \text{ max } dv/dt (ml/sec) = (LV-PER) \times LVEDV$ ;  
 $LA \text{ max } dv/dt (ml/sec) = (LA-PFR) \times LAV$ , where LV end-diastolic volume(LVEDV) and LA maximal volume(LAV) were measured by using echocardiography.

There was significant ( $p < 0.001$ ) correlation between LV max  $dv/dt$ , as the index of LV contraction, and LA max  $dv/dt$ , as the index of LA filling ( $r = 0.603$ ).

Thus, these result suggest that LA filling is closely affected by LV contraction.