of %dWT in IH was significantly greater than that of OH during aortic occlusion, and at the level of 30–40% increase in end-systolic LVP, FC in IH ($55.5 \pm 15.7\%$) was not significantly different from OH ($40.2 \pm 12.9\%$).

Thus, non-uniformal dynamics of IH and OH wall thickening is maintained during increasing in afterload with positive inotropic agent, while the non-uniformity is modified by propranolol.

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A NEW INDEX OF LEFT VENTRICULAR CONTRACTION BY ECHOCARDIOGRAPHY—QUANTITATIVE EVALUATION OF LEFT VENTRICULAR WALL THICKENING—

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To assess the left ventricular (LV) contractility non-invasively, LV wall thickening was quantitatively evaluated by two dimensional echocardiography in 22 patients (13 with LV asynergy and 9 without LV asynergy). Using the parasternal short axis views (at the levels of mitral valve, chordae tendineae, papillary muscle) recorded on the video tape, endocardium and epicardium of the still images at the end-systolic and end-diastolic phases were traced with digital analyzer, and the mean LV wall thickness was obtained. The value of the mean systolic LV wall thickness divided by mean diastolic LV wall thickness (ES/ED) was considered to be a LV contractile index. Mean Vcf was evaluated with a usual method by m-mode echocardiography. LV pressure, dp/dt and dp/dt/p (simultaneously recorded with Miller's catheter tip micromanometer), LV ejection fraction (by cineangiography) and cardiac output (by dye dilution method) were evaluated by invasive methods. And these invasive data were compared with ES/ED and mean Vcf. Then dobutamine infusion ($10 \mu\text{g/kg/min}$) was performed for 15 minutes to assess the changes of LV contractility. As results, ES/ED had good correlations with LV ejection fraction ($r=0.743$), with peak dp/dt ($r=0.855$), and with peak dp/dt/p ($r=0.646$). While mean Vcf had poor correlations with LV ejection fraction ($r=0.567$), with peak dp/dt ($r=0.491$), and with peak dp/dt/p ($r=0.515$). With the manipulation of dobutamine infusion, ES/ED increased from 1.28 ± 0.11 to 1.41 ± 0.13 , peak dp/dt from $1340 \pm 208 \text{ mmHg/sec}$ to $4160 \pm 1550 \text{ mmHg/sec}$ and peak dp/dt/p from $27.7 \pm 5.1 \text{ sec}^{-1}$ to $66.6 \pm 20.4 \text{ sec}^{-1}$. ES/ED was well correlated with peak dp/dt ($r=0.660$) and peak dp/dt/p ($r=0.665$) even with dobutamine infusion.

In conclusion, ES/ED was well correlated with invasively obtained LV contractile indices more than mean Vcf did. And these correlations were also noted during dobutamine infusion. Thus, ES/ED may be a good LV contractile index in patients with or without LV asynergy.

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NON-INVASIVE EVALUATION OF THE RESERVE OF CARDIAC FUNCTION BY THE AORTIC FLOW ACCELERATION TO EXERCISE

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The aortic blood flow (F), determined non-invasively by ultrasonic pulsed Doppler flowmeter, would be of value reflecting left ventricular function. The peak aortic flow acceleration

(dF/dt) was derived from the slope of steepest part of F pattern. Cardiac output (CO) was determined from the product of F and the aortic cross sectional area. These parameter to exercise by supine bicycle ergometer (50watts, 3min.) was recorded continuously for 7 normal subjects and 5 patients with myocardial infarction. Response of peak dF/dt is needed the normalized with the response of CO due to the exercise, in order to obtain the reserve of the myocardial contractility inherently to each heart. (%peak dF/dt)/(%CO)

1. The value of peak dF/dt at rest showed significantly higher in normal subjects than in patients having ejection fraction less than 50%. ($p < 0.05$)
  2. Pattern of F showed steep rising slope and high peak value in normal. Patients showed pattern like trapezoid.
  3. Response of peak dF/dt during exercise in normal was gradually increased and formed the peak at the end of exercise. Patients did not showed a significant increase.
  4. (%peak dF/dt)/(%CO) was 0.99 in normal subjects higher than 0.67 in patients ($p < 0.05$)
- Consequently, (%peak dF/dt)/(%CO) is a very useful index for evaluating the reserve of cardiac contractility.

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ASSESSMENT OF SLOPE OF END-SYSTOLIC PRESSURE-VOLUME LINE (E_{max}) OF IN SITU DOG HEART

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The purpose of this study was to establish a new method of assessment of the slope (E_{max}) of the end-systolic pressure-volume line (ESPVL) of in situ heart. In anesthetized open-chest dogs, a set of the last steady-state ejecting contraction and the first interposed isovolumic contraction was obtained by an abrupt aortic occlusion. We plotted ventricular pressure measured with a catheter-tip manometer against time integral of aortic flow measured with an electromagnetic flowmeter of the last ejecting and the first isovolumic contraction assuming the same end-diastolic volume. ESPVL was drawn from the peak isovolumic pressure-volume point tangential to the left upper corner of the pressure-volume loop of the ejecting contraction. E_{max} was 16.4 ± 3.0 (SE) mmHg/ml (nine ventricles) in control run, and was increased by $59 \pm 19\%$ under isoproterenol and decreased by $47 \pm 9\%$ after propranolol. E_{max} was insensitive to heart rate (107–221 beats/min). We conclude that E_{max} by this aortic occlusion method is useful for assessment of left ventricular contractility of the in situ dog heart.