Thus, the response of myocardium to sympathetic stimulation was restored in the late post-ischemic period despite of impaired NE release from cardiac nerve endings.

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THE MYOCARDIAL FUNCTION UNDER THE REPERFUSED MYOCARDIUM

-THE EFFECTS OF VASODILATOR AND INOTROPIC AGENT-

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In order to evaluate the mechanisms of the early deterioration of myocardial function and the reserve of systolic function, we studied postextra-systolic potentiation (PESP) and the effects of drug intervention. In anesthetized 22 dogs, the proximal LAD was occluded for 15 min followed by 20 min reperfusion. Before LAD occlusion and 15 min after reperfusion, PESP by sonomicrometry and time constant (TC) of left ventricular pressure during isovolumic relaxation period were compared and their changes by nitroglycerin (N) or dobutamine (D) were studied. As the results, %systolic shortening (%SS) of ischemic segment was decreased quickly after occlusion and systolic bulging appeared. After reperfusion, %SS showed only 40% of control level but recovered to 80% by PESP. These data suggest that systolic function of ischemic segment is depressed severely without irreversible structural damage but its functional reserve is preserved well. Then the prolonged myocardial dysfunction may be linked to disorder of intracellular Ca utilization. TC increased after occlusion but decreased after reperfusion. With D, %SS showed prominent recovery and %SS of PESP after reperfusion showed almost the same level as that of preocclusion. Its recovery was accompanied with shortening of systolic length, so the effect of D was due to enhancement of myocardial contractility. With N, recovery of systolic function was seen but it was smaller than D group. And its improvement was appeared with both systolic and diastolic length, then the effect of N was due to preload reduction.

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THE RELATIONSHIP BETWEEN AORTIC INPUT IMPEDANCE (CHARACTERISTIC IMPEDANCE) AND SYSTOLIC AORTIC PRESSURE

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To investigate the relationship between characteristic impedance (Zc) and systolic aortic pressure (Ps), aortic input impedance was measured in extra-anatomically bypassed dogs and the three elements of the afterload system; resistance (R), compliance (C) and Zc, were estimated from the impedance spectrum obtained by the random excitation method. The aorta was bypassed from ascending aorta to abdominal aorta and the aortic arch was clamped between brachiocephalic artery and left subclavian artery. The Zc of bypass increased to 0.245 ± 0.034 mmHg.sec/ml which amounted to 255% of Zc in control (0.096 ± 0.042 mmHg.sec/ml). There was

no difference in R (control; 1.99 ± 0.48 vs. bypass; 2.00 ± 0.61 mmHg.sec/ml) nor in C (control; 0.544 ± 0.169 vs. bypass; 0.473 ± 0.070 ml/mmHg). The Ps increased from 105 ± 8 mmHg to 131 ± 5 mmHg. The attachment of 500 ml air chamber near the proximal end of bypass reduced Zc (0.161 ± 0.051 mmHg.sec/ml) and increased C (0.974 ± 0.129 ml/mmHg) with no change in R (2.02 ± 0.58 mmHg.sec/ml). The Ps decreased to 113 ± 10 mmHg. In these interventions there was no difference in mean aortic pressure (Pm).

There was good correlation between Ps normalized by Pm (Ps/Pm) and Zc normalized by R (Zc/R); $(Ps/Pm) = 2.29 \times (Zc/R) + 1.25$, $r = 0.82$, $P = 0.000104$. Pulse pressure (PP) also correlated with Zc; $(PP/Pm) = 2.47 \times (Zc/R) + 0.22$, $r = 0.753$, $P = 0.000309$. However, there was no significant correlation between Ps/Pm and C nor PP/Pm and C. Thus the good correlation between Ps/Pm and Zc/R made us conclude that Zc is an important parameter of the ventricular afterload.

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INTERDEPENDENT RIGHT AND LEFT VENTRICULAR/VASCULAR COUPLING

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To evaluate the interdependence of right and left ventricle and their interaction to pulmonary and systemic arteries, were simultaneously studied aortic and pulmonary vascular impedance under Nifedipine (Nif.) administration in 12 patients and tilting test in 5 patients of 12 without heart failure using two multisensor catheters. Nif. (10 mg) induced an increase in aortic flow velocity from 85 cm/sec to 111 through a decrease in mean systemic blood pressure from 102 mmHg to 90, in systemic input resistance from 1664 dyne.cm.sec⁻⁵ to 1126 and reduction in reflexion wave index from 48 dyne.cm.sec⁻⁵ to 31 , while pulmonary vasculature did not change significantly except decrease in pulmonary input resistance from 379 dyne.cm.sec⁻⁵ to 320 . 15 degree head down tilting induced an increase in pulmonary input resistance from 397 dyne.cm.sec⁻⁵ to 471 , while it decreased systemic resistance from 1702 to 1523 .

The results indicated that right and left ventricular performance under drug administration (Nif.) and various maneuver (tilting) might be altered independently or additionally by pulmonary and/or systemic arterial reaction.

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VENTRICULO-ARTERIAL INTERACTION IN NORMAL AND FAILING HEART IN MAN

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To investigate the ventriculo-arterial coupling in normal subjects (10 cases, group A) and in patients with moderate (EF: 40-59%, 7 cases, group B) and severe (EF: <40%, 8 cases, group C) cardiac dysfunction, we obtained both endsystolic pressure volume relationship (Ees)