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**757-6 Systemic Hemodynamic and Renal Excretory Effects of a Continuous 4-Hour Infusion of Human Brain Natriuretic Peptide in Patients with Heart Failure**

William T. Abraham, Brian D. Lowes, Debra A. Ferguson, Eugene E. Wolfel, JoAnn Lindenfeld, Robert W. Schrier, Michael R. Bristow. *University of Colorado Health Sciences Center, Denver, Colorado*

The pharmacological activities of a prolonged infusion of human brain natriuretic peptide (hBNP, Natrecor™) have not been previously described. Thus, the systemic hemodynamic and renal excretory responses to a continuous 4-hour infusion of hBNP were determined in 6 patients with advanced NYHA class III heart failure. Four patients had ischemic cardiomyopathy, while 2 had idiopathic dilated cardiomyopathy. The mean (±SEM) left ventricular ejection fraction for the group was 17.2 ± 2.6% (range 14–30%). Patients were evaluated during three 4-hour study periods: baseline, hBNP infusion (0.025 µg/kg/min), and post-treatment (recovery). During the study periods, urinary volume losses were replaced hourly with 0.45% saline solution. Baseline hemodynamics were significant for a mean pulmonary capillary wedge pressure (PCWP) of 25 ± 5 mmHg and an average cardiac index of 1.96 ± 0.20 L/min/m<sup>2</sup>. During the infusion of hBNP, PCWP decreased significantly to 12 ± 2 mmHg (p < 0.05, see figure), despite maintenance of a constant body fluid volume status. Cardiac index increased in all subjects in association with a decrease in systemic vascular resistance during the hBNP infusion. There were no changes in arterial blood pressure in response to this dose of hBNP. hBNP produced increases in urinary sodium and volume excretion in 5 of the 6 patients.

**Conclusion:** This first study of a prolonged infusion of hBNP in patients with heart failure demonstrates that hBNP is pharmacologically active and has potential in the therapy of heart failure.

**758 Exercise and Heart Failure**

Tuesday, March 21, 1995, 2:00 p.m.–3:30 p.m.  
Ernest N. Morial Convention Center, Room 64

2:00

**758-1 Vasodilator Capacity of Coronary Resistance Vessels is Maintained by Chronic Exercise Training During Development of Heart Failure in Awake Dogs**

Geng-Hua Yi, Mathias Knecht, Milton Packer, Daniel Burkhoff, Jie Wang. *Columbia-Presbyterian Medical Center, New York City, New York*

Previous studies have shown that coronary vasodilator capacity which reflects vasomotion of coronary resistance vessels is enhanced after chronic exercise (EX) training in normal dogs. The goal of this study was to determine whether EX would preserve coronary dilator capacity during development of heart failure. Dogs (n = 4) were chronically instrumented to measure systemic hemodynamics, coronary blood flow (CBF) and for chronic pacing. Dogs were cardiac paced for 4 weeks (210 b/min for 3 weeks and 240 b/min for the 4th week) and exercised on a treadmill 2 hours/day during this pacing period. The peak CBF responses following release of a brief coronary artery occlusion (Occ.) and to acetylcholine (Ach) were examined before and after this cardiac pacing and EX combined regimen. The results (Unit: ml/min) are as follows.

	Before pacing & ex			After pacing & ex		
	Baseline	Res.	Delta	Baseline	Res.	Delta
Occ. (s)						
5s	19 ± 1	59 ± 5	40 ± 4	27 ± 2	66 ± 7	40 ± 5
10s	20 ± 1	65 ± 6	45 ± 5	27 ± 2	80 ± 5	53 ± 2
15s	20 ± 2	78 ± 7	57 ± 15	27 ± 3	69 ± 10	42 ± 8
20s	20 ± 1	78 ± 17	59 ± 16	27 ± 2	98 ± 8	70 ± 10
30s	21 ± 2	98 ± 16	77 ± 15	27 ± 3	105 ± 12	80 ± 14
Ach. (µg/kg)						
0.25	22 ± 1	33 ± 3	11 ± 4	24 ± 5	41 ± 1	17 ± 5
0.5	21 ± 3	38 ± 4	17 ± 6	24 ± 4	41 ± 1	17 ± 5
1	21 ± 2	42 ± 1	25 ± 1	24 ± 2	50 ± 2	26 ± 1
5	22 ± 3	59 ± 3	37 ± 5	24 ± 2	56 ± 1	32 ± 2
20	22 ± 2	64 ± 6	43 ± 6	24 ± 2	53 ± 1	29 ± 2*

\*, p < 0.05 from before pacing and EX

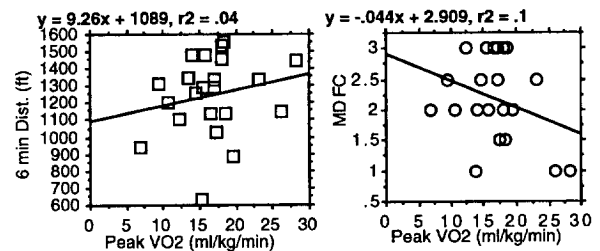
The peak CBF response to nitroglycerin (NTG) was not changed. In contrast, CBF responses responses to Occ, Ach and NTG were impaired in dogs with the same pacing regimen but without EX. Thus, EX might play a potential role to protect vasodilator capacity of coronary resistance vessels during development of heart failure.

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**758-2 Failure of 6 Minute Walk to Predict Exercise Capacity in Patients Evaluated for Cardiac Transplantation**

Ronald M. Fritz, Gordon Blackburn, Lynn Luthern, Robert Veldhuis. *Cleveland Clinic Foundation, Cleveland, Ohio*

In patients evaluated for cardiac transplantation the measured peak oxygen consumption is an objective and powerful predictor of survival that helps to prioritize patients on the transplant list. The 6 minute walk has been shown to correlate with NYHA functional class and to predict morbidity and mortality in patients with congestive heart failure but its correlation with VO2 max has not been established. The easily performed 6 minute walk would be an ideal screening test for congestive heart failure patients if it could be shown to correlate with VO2 max. We studied 24 patients with CHF who were undergoing cardiac transplant evaluation. Functional class assessment was obtained prior to performing the 6 minute walk and subsequent metabolic stress test. Patients were given standardized instructions for the 6 minute walk and all tests were supervised by one Exercise Physiologist. Coaching was kept to a minimum since this has been shown to effect the test results. Metabolic stress testing was performed within 1 hour of the 6 minute walk. **Results:** Regression analysis showed little correlation between the 6 minute walk distance and the measured VO2 max (R squared = 0.04, p = 0.375). The physician determined NYHA functional class correlated poorly with VO2 max (R squared = 0.1, p = 0.151).



**Conclusion:** Neither the 6 minute walk distance nor the physician determined functional class correlates well with the measured VO2 max obtained during metabolic stress testing and appear not to be reliable screening tests for patients considered for cardiac transplantation.

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**758-3 Right Ventricular Ejection Fraction is an Independent Predictor of Maximum Oxygen Consumption in Advanced Heart Failure**

Thomas Di Salvo, Michael Mathier, Dennis McNamara, Marc Semigran, G. William Dec. *Massachusetts General Hospital and Harvard Medical School, Boston, MA*

Maximum oxygen consumption (MVO<sub>2</sub>), left ventricular ejection fraction (LVEF), and left ventricular end-diastolic volume index (LVEDVI) are important determinants of prognosis in heart failure (HF). To determine the ventriculographic parameters influencing MVO<sub>2</sub>, simultaneous cardiopulmonary exercise testing (cycle ergometry) and first-pass rest and exercise radionuclide ventriculography were performed in 66 patients with advanced HF (age 51 ± 9.9 mean ± SD, NYHA 3 ± 0.6, LVEF 0.22 ± 0.07, RVEF 0.29 ± 0.11, LVEDVI 154 ± 49 ml/M<sup>2</sup>) during initial cardiac transplant evaluation. Mean percent predicted age-sex adjusted MVO<sub>2</sub> achieved (%MVO<sub>2</sub>) was 38 ± 12%. Univariate predictors of %MVO<sub>2</sub> included RVEF at rest (p = 0.001), RVEF at peak exercise (p = 0.001), %maximum heart rate achieved (%MHR, p < 0.01), LVESVI (p < 0.05), and NYHA (p = 0.05). Resting HR, resting or peak systolic or diastolic blood pressure, resting or peak exercise LVEF, exercise-related rise or fall > 0.05 in either LVEF or RVEF, rest or peak exercise cardiac index, rest or peak exercise LVEDVI, NYHA, and diagnosis were not significant univariate predictors of %MVO<sub>2</sub>. RVEF at rest (p = 0.001) and %MHR (p = 0.01) were the only independent predictors in a multiple linear regression model.

**Conclusions:** In patients with advanced HF, 1) RVEF is an independent predictor of %MVO<sub>2</sub> and 2) neither rest or exercise LVEF predicts %MVO<sub>2</sub>.

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**758-4 Short Term Endurance Training Increases the Muscular Aerobic Capacity in Heart Transplant Patients**

Bertrand Mettauer, Eliane Lampert, Hans Hoppeler<sup>1</sup>, Eric Epailly, Blandine Schneidecker, Bernard Geny, Francois Levy, Jean Lonsdorfer. *Physiology Dept., CHRU, Strasbourg, France; <sup>1</sup>Dept. of Anatomy, Bern University, Switzerland*

Heart transplant patients (HTR) remain limited in their exercise capacity partly

TUESDAY  
P.M.