Methods: 51 patients (pts) were prospectively randomized to either a training group (T) or to a physically inactive control group (C). At the beginning (B) and after 6 months (E), pts were instrumented with a: thermodilution catheter positioned into the right a. pulmonalis. Hemodynamics were measured simultaneously at rest and during cycle ergometry. Left ventricular enddiastolic diameter (LVEDD) was assessed by echocardiography.

Results: After exercise training (ET) there was a significant decrease in SVR at rest by 10% (from 1660 ± 515 to 1490 ± 460 dyne·sec·cm^{-5}; $p < 0.05$ vs. C) and during submaximal (sm) exercise by 28% (from 911 ± 345 to 649 ± 212 dyne·sec·cm^{-5}; $p < 0.05$ vs C). LVEDD decreased by 7% from 73 ± 10 to 68 ± 9 ($p < 0.05$ vs B). Cardiac output remained unchanged at rest and during sm exercise. Stroke volume (SV) increased at rest by 28% from 53 ± 16 to 68 ± 27 ml ($p < 0.05$ vs C). ET leads to a decrease in NOR and EPI at rest (NOR: 3.11 ± 2.22 vs 1.99 ± 1.36 nmol/l, EPI: 0.42 ± 0.20 vs 0.28 ± 0.17 nmol/l) and during sm exercise (NOR: 9.16 ± 5.64 vs 5.87 ± 2.97 nmol/l, EPI: 1.01 ± 0.74 vs 0.74 ± 0.57 nmol/l). Changes in SVR were significantly related to changes in SV ($r = -0.85$; $p < 0.0001$) and changes in LVEDD ($r = 0.35$; $p < 0.05$).

Conclusion: The results of the present study suggest that long-term; physical exercise training leads to a significant afterload reduction in pts with stable CHF accompanied by a small improvement in cardiac function and dimension.

10:45

847-2 The Discriminant Prognostic Value of Adding Exercise Myocardial SPECT Imaging to Peak Oxygen Uptake (MVO2) in Congestive Heart Failure Patients

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Previous studies have demonstrated the prognostic value of peak exercise oxygen uptake (MVO2) < 14 ml/kg per min or stress myocardial perfusion defects in congestive heart failure (CHF) patients. To determine their relative prognostic value, we followed 85 CHF pts (81% ischemic cardiomyopathy, NYHA Class III–IV = 41 pts, mean LVEF = 0.37, mean age = 51 yrs, 79% male) for 2 yrs after symptom-limited exercise MVO2 + stress myocardial tomography (SPECT). Cardiac events were defined as "hard" (death, MI, transplantation) or "soft" (hospitalization, ↑ NYHA class, coronary revascularization or unstable angina). Cox analysis of 2-year event-free survival is graphed below for: ○ = MVO2 ≥ 14 with ≥ 1 SPECT defect (n = 35 pts), □ = MVO2 < 14 with ≥ 1 SPECT defect (n = 15), • MVO2 ≥ 14 with < 1 SPECT defect (n = 17), ■ = MVO2 < 14 with < 1 SPECT defect (n = 18) for any event [Fig 1] and "hard" events [Fig 2].

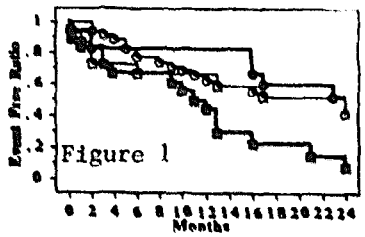

Figure 1

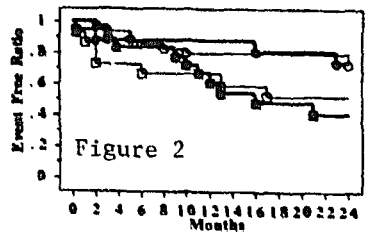

Figure 2

Event-free survival was significantly poorer in pts with MVO2 < 14 and < 1 SPECT defect (7% vs 42–52%; all $p < 0.05$). "Hard" event-free survival did not differ in pts with ≥ 1 vs < 1 SPECT defect and MVO2 < 14 (52 vs 41%) or MVO2 ≥ 14 (73 vs 74%; both p = ns).

We conclude that combined exercise MV02 and SPECT defines a very high risk CHF subset, but that SPECT imaging does not provide discriminant survival information beyond MV02 regarding "hard events" in congestive heart failure patients.

11:00

847-3 Predictors of Exercise Performance Following Cardiac Transplantation in Males

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Cardiopulmonary exercise testing is an effective method of identifying individuals at risk for adverse cardiac events both pre and post cardiac transplantation. There is variable improvement in exercise performance in patients following cardiac transplantation. We studied 70 patients ≥ 1 year post-transplantation to determine the clinical, hemodynamic, and demographic predictors of exercise performance. Right and left heart catheterization, endomyocardial biopsy, coronary flow reserve (Doppler guide wire and adenosine) and cardiopulmonary stress testing (peak VO_2) were performed within 24 hours of each other. The patients were all males with an average age of 51 ± 1 who were studied an average of 3.9 ± 0.3 years post-transplant. Multivariate predictors of peak VO_2 using a multiple linear regression model were patient age ($P < 0.0001$), hemoglobin ($P = 0.0001$), left ventricular stroke work index ($P = 0.003$), body mass index ($P = 0.022$), and serum triglycerides ($P = 0.022$) This model yields an adjusted $r^2 = 0.62$. Biopsy grade, donor age, days post- transplant, and coronary flow reserve had no effect on PVO_2.

Conclusion: Patient age and serum hemoglobin are the strongest predictors of peak VO_2 post-heart transplant. Obesity and elevated serum triglycerides also have a major negative impact on exercise performance in cardiac allograft recipients.

11:15

847-4 Hemodynamic Ventilatory and Metabolic Effects of Isometric Handgrip Exercise in Patients With Chronic Heart Failure

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Background: The present study was designed to examine hemodynamic ventilatory and metabolic responses during isometric exercise (IE) in patients *(pts) with chronic heart failure (CHF) compared to healthy subjects.*

Methods: 17 pts (mean age 50.7 ± 12 years) with non-ischemic dilated cardiomyopathy (EF <45%) in stable condition and 8 healthy subjects (control) matched for age, weight and height were studied. Each subject underwent supine left and right heart catheterization with gas exchange analysis at rest and at the peak of 5 mn isometric handgrip exercise at 40% of maximal voluntary contraction.

Results: Cardiac index, pulmonary vascular resistances and right atrial pressure did not increase significantly in both groups; heart rate, mean arterial pressure, systolic left ventricular (LV) pressure increase in similar proportions at peak exercise in both groups; stroke volume decrease significantly and similarly in both groups. In group CHF IE produced further increase ($p < 0.05$) compared to control group in LV end diastolic pressure (13.64 ± 7.19 to 24.47 ± 12.6 vs 11.25 ± to 14.93 ± 7.98 mm Hg), pulmonary mean pressure (17.44 ± 8.08 to 28.76 ± 12.04 vs 13.62 ± 1.84 to 14.62 ± 3.77 mm Hg) and pulmonary wedge pressure (10.32 ± 6.83 to 20.17 ± 11.03 vs 7.62 ± 3.11 to 8.87 ± 4.22 mm Hg). The mean increase in minute ventilation, respiratory frequency and 02 uptake was identical in both groups.

Conclusion: Isometric exercise can have adverse effects on cardiac performance in pts with CHF; the increase in pulmonary capillary wedge pressure, pulmonary arterial pressure and left ventricular end diastolic pressure differ from the response to static exercise in control subjects.

11:30

847-5 Improvements in Work Efficiency Result in Enhanced Functional Status and Quality of Life Following Exercise Training in Heart Failure

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Background: Chronic congestive heart failure (CHF) can often lead to dramatic reductions in functional capacity and measures of quality of life (QoL). Although cardiac rehabilitation and exercise training can improve self-rated measures of functional status in CHF patients, there is little change reported in measured peak aerobic capacity ($PkVO_2$).

Methods: To investigate this discrepancy, we assessed work efficiency (WEf) defined as $\Delta watts/\Delta VO_2$ during cardiopulmonary exercise testing (CPX) and validated measures of QoL (MOS Short Form-36 survey) in 20 CHF patients (mean EF = 22 ± 5%; NYHA = 2.6 ± 0.4), before and after a 3-month program (36 supervised exercise sessions plus home exercise) of cardiac rehabilitation and exercise training (see table).

Results: Change in WEf was the only objective parameter which correlated with improvements in self-rated functional status ($r = 0.72$; $p < 0.01$).

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