

**1145-126 Left Ventricular Assist Device Implantation Induces Neo-Neurogenesis Accompanied by Neo-Angiogenesis in the Nonscarred Myocardium in Patients With Heart Failure**

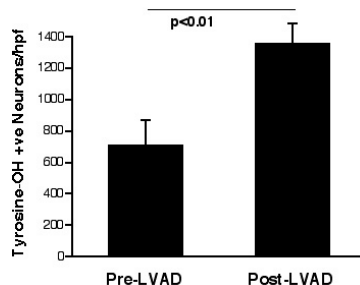
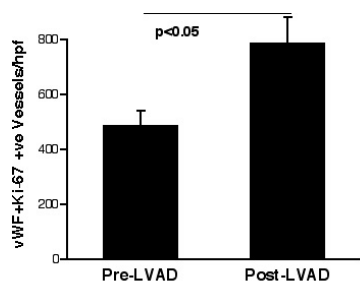
Porur Somasundaram, Ruth Anway, Jennifer Hall, Inder Anand, Leslie Miller, Y. Chandrashekhar, University of Minnesota, Minneapolis, MN, VA Medical Center, Minneapolis, MN

**Background:** End stage heart failure (esHF) is associated with reduced blood vessel and nerve density. LVAD implantation reverses ventricular myocyte & fibrous tissue remodeling but it is not clear if it can also optimize neo-angiogenesis and repopulate myocardial nerves.

**Hypothesis:** LVAD implantation will re-innervate the heart along with neo-angiogenesis while reversing ventricular remodeling.

**Methods:** Myocardial nerve growth (immunostaining with PGP for total nerves, GAP43 + tyrosine hydroxylase for new sympathetic nerves) and neo-angiogenesis (vWF+Ki-67 staining) was measured in the non-scar myocardium at LVAD implant and at transplantation in 6 patients with esHF (4 ischemic and 2 non-ischemic).

**Results:** Time between LVAD and transplant 151-681 days. LVAD implantation significantly improved total & new blood vessel density ( $p < 0.05$ ) while inducing reverse remodeling. This was accompanied by increased new sympathetic innervation in the same region. **Conclusion:** LVAD implantation facilitates neo-angiogenesis. This may help in the process of reverse remodeling seen after LVAD use. LVAD also induces new nerve growth in non-scar myocardium. Its significance in terms of arrhythmic potential, especially in patients being considered for LVAD explantation, needs to be determined.



POSTER SESSION

**1146 Exercise Testing and Cardiovascular Disease Prognosis**

Tuesday, March 09, 2004, Noon-2:00 p.m.  
 Morial Convention Center, Hall G  
 Presentation Hour: 1:00 p.m.-2:00 p.m.

**1146-105 The Prognostic Significance of Exercise-Induced Atrial Arrhythmias**

Thomas J. Bunch, Krishnaswamy Chandrasekaran, Bernard J. Gersh, Stephen C. Hammill, David O. Hodge, Akbar H. Khan, Douglas L. Packer, Patricia A. Pellikka, Mayo Clinic, Rochester, MN

**Background:** Although stress-induced atrial arrhythmias are common during exercise testing, there is a paucity of data regarding the correlation with underlying heart disease and cardiovascular outcomes. Atrial arrhythmias may reflect underlying left atrial enlargement and diastolic dysfunction, which are prognostic of mortality. We hypothesized these stress-induced arrhythmias are associated with long-term adverse cardiac events.

**Methods:** Exercise echocardiography was performed in 5,375 patients (age  $61 \pm 12$  years) with known or suspected coronary artery disease. An abnormal result was defined as exercise-induced atrial fibrillation/flutter (AF), supraventricular tachycardia (SVT), or atrial ectopy (AE).

**Results:** Three hundred and eleven patients (5.8%) died (132 (2.5%) cardiac causes) over a period of  $3.1 \pm 1.7$  years. In addition, 193 patients (3.6%) experienced a MI, and 531 (9.9%) required revascularization. During exercise testing, 1272 (24%) developed AE, 185 (3.4%) SVT, and 43 (0.8%) AF. The 5-year cardiac death rate was not statisti-

cally different between groups [none (3.8%), AE (4.3%), SVT (3.7%), AF (0%),  $p=0.43$ ]. However, the 5-year rate of MI was significantly different between groups [none (5.7%), AE (8.3%), SVT (0%), AF (9.0%),  $p=0.005$ ]. The 5-year rate of revascularization between groups was not significantly different [none (14.2%), AE (17.0%), SVT (11.8%), AF (14.8%),  $p=0.50$ ]. A composite of all 5-year adverse endpoints was similar between groups [none (22.7%), AE (27.8%), SVT (17.7%), AF (25.7%),  $p=0.10$ ]. In stepwise multivariate analysis, AE was not predictive of myocardial infarction when taking into account traditional clinical variables and exercise test results.

**Conclusion:** In this large cohort of patients, the occurrence of atrial ectopy was predictive of an increased risk of myocardial infarction. However, this association did not persist after adjustment for clinical and exercise variables known to predict adverse long-term cardiovascular outcomes. The rate of long-term cardiac death or revascularization was not influenced by the development of stress-induced atrial arrhythmias.

**1146-106 Does Abatement of Ventricular Ectopy With Exercise Mean a Better Prognosis?**

Obadah Alchekakie, Michael S. Lauer, Mina K. Chung, Cleveland Clinic Foundation, Cleveland, OH

**Background:** Among patients with frequent ventricular ectopy at rest, it is believed that an abatement of ventricular ectopy during exercise testing predicts a lower risk of death.

**Methods:** We followed 920 consecutive patients (age= $62 \pm 11$ , 78% male) with frequent ventricular ectopy at rest just before undergoing exercise testing and who had no history of heart failure, valve disease, pacemakers, or atrial fibrillation. Frequent ventricular ectopy before, during, and after exercise was defined as more than 7 ventricular premature depolarizations per minute, frequent couplets, any triplets, bigeminy, trigeminy, non-sustained or sustained ventricular tachycardia, or ventricular fibrillation. Abatement was considered present if there was no frequent ventricular ectopy during exercise. **Results:** There were 214 patients (23%) who had an abatement of ventricular ectopy during exercise. During 7 years of follow-up there were 142 deaths. Patients with abatement of ventricular ectopy were more likely to be women (33% vs. 19%,  $P < 0.0001$ ) and less likely to have a history of coronary bypass grafting (18% vs. 27%,  $P=0.005$ ), but there were no marked differences in age (61 vs. 62), diagnosis of coronary disease (46% vs. 44%), or reduced physical fitness (29% vs. 27%). Seven-year death rates tended to be slightly lower among patients with abatement compared to those without (14.3% vs. 17.3%,  $P=0.87$ ). After accounting for age, gender, standard risk factors, medications, resting electrocardiographic findings, functional capacity, and heart rate recovery, abatement did not predict a lower risk of death (adjusted hazard ratio 1.03, 95% confidence interval 0.70-1.54,  $P=0.87$ ). **Conclusion:** Among patients with frequent ventricular ectopy at rest, abatement of ectopy during exercise does not predict a lower risk of death.

**1146-107 Severe Frequent Ventricular Ectopy After Exercise as a Predictor of Death in Patients With Advanced Systolic Heart Failure**

James O. O'Neill, James B. Young, Claire E. Pothier, Michael S. Lauer, Cleveland Clinic Foundation, Cleveland, OH

**Background:** Although ventricular ectopy during recovery after exercise predicts death in patients without heart failure, its prognostic importance in patients with advanced heart failure is unknown.

**Methods:** Systematic electrocardiographic data during rest, exercise and recovery were gathered on 2123 consecutive Cleveland Clinic Foundation patients with left ventricular systolic ejection fraction  $\leq 35\%$  who were referred for symptom limited metabolic treadmill exercise testing. Severe ventricular ectopy was defined as the presence of ventricular triplets, sustained or non-sustained ventricular tachycardia, ventricular flutter, polymorphic ventricular tachycardia or ventricular fibrillation. The primary end point was all cause mortality, with censoring for interval cardiac transplantation.

**Results:** Of 2,123 patients, 140 (7%) had severe ventricular ectopy in recovery. There were 561 deaths during follow-up (median among survivors 2.9 years). Severe ventricular ectopy during recovery was associated with an increased risk of death compared to patients without severe ectopy (3-year death rates 37% vs. 22%, hazard ratio 1.76, 95% CI 1.32 - 2.34,  $P < 0.0001$ ). After adjustment for ventricular ectopy at rest and during exercise, peak oxygen uptake, and other potential confounders, severe ventricular ectopy in recovery remained predictive of death (adjusted hazard ratio 1.48; 95% confidence interval 1.10-1.97;  $p=0.0089$ ), whereas ventricular ectopy during exercise was not predictive.

**Conclusion:** Severe ventricular ectopy during recovery after exercise is predictive of increased mortality in patients with severe heart failure.

**1146-108 Association of Triglyceride to High-Density Lipoprotein Cholesterol Ratio With Heart Rate Recovery in Healthy Adults**

Mehdi H. Shishebor, Byron J. Hoogwerf, Michael S. Lauer, Cleveland Clinic Foundation, Cleveland, OH

**Background:** Insulin resistance is associated with altered autonomic function. An attenuated decrease in heart rate immediately after exercise (or heart rate recovery) predicts all-cause mortality and is believed to reflect decreased parasympathetic activity. Utilizing TG/HDL-C concentration as a marker of insulin resistance we sought to assess the association between insulin resistance and heart rate recovery.

**Methods:** Our study population included 4963 healthy adults who participated in the Lipid Research Clinics' Prevalence Study and who underwent exercise testing. Heart rate recovery was considered abnormal if  $\leq 42$  beats per minute two minutes into recovery. Fasting blood specimens were drawn for lipid profiles and blood glucose.

**Results:** Individuals in the highest quartile of TG/HDL-C had significantly higher prevalence of abnormal heart rate recovery (HRR) (40% vs. 30%; multivariable adjusted prevalence ratio, 1.18; 95% CI 1.01-1.39;  $P = 0.04$ ). When considered as a continuous