1165-133 Basal Respiratory Exchange Ratio Is Altered With Statin Use in Normals

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Background: Statin therapy is prescribed for increasing numbers of patients. Previous work in statin myotoxicity has suggested a defect in fatty acid oxidation. The fasting respiratory exchange ratio (RER) provides a means to identify substrate use. This project assesses aerobic function and substrate utilization on statin therapy using cardiopulmonary exercise testing.
Methods: Six normal control volunteers performed two identical exercise regimens six weeks apart while fasting on and off statins. The Orca® cardiopulmonary exercise testing system was calibrated to a known gas mixture before each test. The protocol consisted of 30 minutes of rest followed by 8 minutes of ramped exercise. Peak oxygen consumption (VO2 max), anaerobic threshold (AT), ventilatory efficiency (VE / VCO2) and parameters of fuel selection, including basal RER, and the change in RER between rest and early exercise (Δ RER) were recorded.
Results: A summary of the results is in the table below.

N	RER off statins	RER on statins	Δ RER* off statins	Δ RER* on statins	VO_2 max off statins ml/min/kg	VO_2 max on statins ml/min/kg	AT off statins ml/min/kg	AT on statins ml/min/kg	Δ VE / Δ VCO_2 off statins	Δ VE / Δ VCO_2 on statins
6	0.76 ± 0.03 †	0.86 ± 0.06 †	0.03 ± 0.04 ‡	0.07 ± 0.03 ‡	37 ±13	37 ± 13	27 ± 7	25 ± 12	25 ± 4	25 ± 3

There was no change in VO2 max, AT, or VE/VCO2 for the subjects on statins. The basal RER was significantly increased on statin therapy († p=0.0001). The Δ RER also demonstrated significant change on statin therapy (‡ p=0.03).
Conclusions: While there was no change in aerobic function on statin therapy, parameters of fuel selection (fasting RER and Δ RER) both increased. This suggests an alteration in fatty acid oxidation related to statin therapy in normals.

1165-134 Can Electrical Muscle Stimulation of the Legs Produce Cardiovascular Exercise?

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Background: Despite its well-known benefits, not everybody is able to undertake physical exercise due to limitations related to their underlying disease (heart failure, obesity etc) or orthopedic/joint problems. New techniques of producing cardiovascular exercise are therefore required that do not involve physical exertion. This study was carried out to investigate a new method of facilitating cardiovascular exercise using electrical muscle stimulation (EMS) of leg muscles.
Methods: Ten healthy volunteers completed 4 EMS training sessions using a hand held, battery operated EMS device. The stimuli were delivered to the quadriceps, hamstring and glutei muscles via appropriately placed silicon rubber electrodes incorporated into a pair of tight fitting shorts. At each session subjects completed 3 minutes of stimulation at each of 4 stimulation outputs (10%, 20%, 30% & 40% of maximum output) whilst cardiopulmonary gas exchange was measured. Physiological responses and comfort levels at increasing levels of stimulation as well as reproducibility of effect were evaluated.
Results: Subjects included 8 males and 2 females with mean age 37.6 ± 6.8 years. Subjects achieved steady state at each level of stimulation with a significant increase in physiological response at successive levels (P<0.0001). Group average heart rate and VO2 at 40% stimulation intensity were 101± 12 BPM and 14.9±4.3 ml/kg/min respectively. At stimulation level of 40% output VO2, VCO2, VE and heart rate increased by 0.69 ± 0.2 L/min, 0.63 ± 0.2 L/min, 13.8 ± 10.8 L/min and 30.1 ± 11.1BPM respectively above resting values. Subjects reported mild discomfort, which improved at successive sessions and demonstrated good reproducibility of effect from session to session.
Conclusion: These results demonstrate that this method of EMS is capable of producing a physiological response consistent with cardiovascular exercise. The stimulation was well tolerated by the subjects and there was good reproducibility of effect. Results will be discussed in detail.

ORAL CONTRIBUTIONS

856 Mechanical Circulatory Assist in Severe Left Ventricular Dysfunction: Bridge to Transplant, Bridge to Recovery, and Destination Therapy

Tuesday, March 09, 2004, 4:00 p.m.-5:00 p.m.
Morial Convention Center, Room 265

4:00 p.m.

856-1 Mechanical Circulatory Support: Evolving Trends in Support Duration

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BACKGROUND: There are increasing anecdotal reports of mechanical circulatory support patients being supported for longer durations. In addition, there have been changes to the waiting list status of device recipients implemented by both UNOS (United Network for Organ Sharing) and Eurotransplant. Furthermore, clinical views regarding optimal transplant timing for device recipients have also evolved (e.g. early experience favored rapid transplantation). To assess the impact of these factors, support durations over the last decade were studied utilizing a large dataset from a single device (Novacor LVAS).
METHODS: The international dataset consisted of all patients implanted with the Novacor LVAS from January 1991 through December 2001 (n=1235). Mean support durations were calculated for each year of the study period. Support durations were also calculated for survivors versus non-survivors. Results were tested for statistical significance using Pearson's correlation coefficient.
RESULTS: Mean support duration for all recipients increased from 32 days in 1991 to 196 days in 2002. For the survivors (i.e. those currently supported, transplanted or weaned), mean support times increased from 40 days in 1991 to 284 days in 2001. There was a strong linear correlation for both of these groups, R^2=0.972 ($p < 0.0001$) and R^2=0.980 ($p < 0.0001$), respectively. In terms of the non-survivors (n=513), the mean support duration rose from 26 days in 1991 to 104 days in 1995 and since that time has remained essentially flat at approximately 100 days, whereas the survivors mean duration continues to increase steadily.
CONCLUSION: 1) Mean support duration for device recipients has increased six-fold during the decade of study. 2) Considering this evolving trend in support duration greater emphasis should be placed on the use of totally implantable devices that permit potential patient hospital discharge.

4:15 p.m.

856-2 Cardiac Recovery During Left Ventricular Assist Device Support: Results From the LVAD Working Group

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Background: Some heart failure (HF) patients supported with a left ventricular assist device (LVAD) demonstrate sufficient cardiac recovery to undergo LVAD explantation. The LVAD Working Group is a multi-center prospective study of cardiac function during LVAD support. Our aim is to define the rate, time course and durability of recovery and to seek markers that might identify explantation candidates.
Methods: Patients undergo monthly evaluation during LVAD support, including echocardiography at full and reduced (4 L/min) LVAD flow and cardiopulmonary exercise testing. Dobutamine echocardiography with hemodynamic measurements are performed in patients demonstrating improvement in resting function.
Results: 64 patients with HF for 58 ± 70 months underwent LVAD implantation during the 14 months of the study. Duration of LVAD support was 165.6 ± 85 days. 32 patients (50%) have been transplanted, 6 have expired (9.4%) and 23 patients remain on LVAD support. After 30 days of support as compared to pre-LVAD, there was significant improvement in left ventricular (LV) ejection fraction (16.6 ± 6.9 vs 35.4 ± 14.1 %, p<.00001) and reduction in LV end diastolic diameter (7.2 ± 1.2 vs 4.8 ± 1.0 cm, p<.00001) and LV mass (321 ± 118 vs 198 ± 82 g, p<.00001). 36% of patients had LVEF > 40% with device flow reduced to 4 L/min. LVEF peaked at 30 days and then plateaued, while LV mass progressively decreased with time. No significant differences were seen between ischemic (44%) and non-ischemic (56%) patients. With longer periods of support, there was significant improvement in peak oxygen consumption (13.4 ± 4.1 vs 19.1 ± 6.4 ml/kg/min, 30 vs 120 days, p<.01). Thirteen patients with improvement in resting function underwent hemodynamic stress testing and 3 patients with acute HF (< 8 days) underwent explantation and have normal LV function 20-27 weeks post-explant. No patients with chronic HF underwent LVAD explantation.
Conclusions: This is the first large prospective study of cardiac function during LVAD support. Our results suggest that LV function improves, but that the degree of recovery is insufficient for device explantation in patients with chronic HF. The addition of novel medical therapies may modify these results.