LVADs Open Window to Myocardial Recovery

**Structural and functional changes in the recovering heart may guide future treatments.**

*BY MARK S. LESNEY*

FROM THE JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY

Left ventricular unloading in patients with end-stage heart failure has been shown to improve with the use of a left-ventricular assist device, according to the results of several recent clinical studies. This improvement includes favorable changes in myocardial structure and function, including beta-adrenergic responsiveness and myocyte contractility.

Several molecular and genetic mechanisms have been correlated with these changes and might provide the basis for improvements in device behavior, as well as indications for potential targets for new therapeutic drugs and altered regimens for existing drugs.

Such new treatments may have the potential to benefit not only patients who have received LVADs, but also heart failure patients as a whole, as reported in a state-of-the-art article (J. Am. Coll. Cardiol. 2011;57:641-52).

The authors wrote. "A subsequent retrospective cohort study of the same group, comparing LVAD patients who did and did not receive ACE inhibitor therapy after implantation, showed a significant decrease in collagen content and myocardial stiffness in the cohort with LVADs and ACE inhibitors. "These findings support the hypothesis that maximizing optimal medical management after ventricular unloading with LVADs may promote myocardial recovery." The study was sponsored by the National Institutes of Health, the American Heart Association, and the National Institutes of Health Research Cardiovascular Biomedical Research Unit at the Royal Brompton and Harefield National Health Service Foundation Trust, and Imperial College London. Several of the authors reported receiving research support and/or honoraria or speakers fees from Thoratec, Heartware Inc., and Medtronic, all manufacturers of LVADs.

High-Altitude Simulator Improves Heart Failure Measures

*BY BRUCE JANCIN*

FROM THE ANNUAL SCIENTIFIC SESSIONS OF THE AMERICAN HEART ASSOCIATION

CHICAGO – Exposing patients with heart failure to altitude training using a portable simulated altitude device appears to provide clinical benefits.

The 10 patients with systolic heart failure enrolled to date in a pilot study responded to a maximum simulated altitude of 2,700 m with significant improvements in left ventricular ejection fraction, quality of life, and three different measures of exercise performance, Dr. Philip Formica reported at the meeting.

Importantly, these benefits were sustained for at least 4 weeks after completion of the simulated altitude treatment sessions using the Hypoxico Inc. altitude tent, added Dr. Formica of Albert Einstein College of Medicine and Montefiore Medical Center, New York.

Commercially available high-altitude simulators such as this are popular with elite bicycle racers, distance runners, and other endurance athletes because adaptation to altitude results in physiologic changes that enhance oxygen delivery to the periphery. Athletes use the devices at altitude in order to, as their coaches teach, "sleep high and train low."

The hypothesis tested in this study was that patients with heart failure would also benefit from acclimatization to altitude. The physiologic changes accompanying this acclimatization include an erythropoietin-induced increase in RBC mass, a rightward shift of the oxyhemoglobin dissociation curve, improved oxygen transport stemming from increased tidal volume and hypoxic ventilatory response, improved left ventricular end-systolic diameter and stroke volume, and greater skeletal muscle capillary density.

The treatment protocol consisted of 10 sessions with the patient sitting in the normobaric hypoxic enclosure; the sessions, each lasting 3-4 hours, were spread over the course of 22 days and were done on an alternate-day schedule. Forty-eight hours prior to the first session, patients went on a twice-daily 125-mg oral acetazolamide, a drug long used to prevent sleep apnea at high altitude and sick symptoms. Patients started at a simulated altitude of 1,500 m, increasing by 300 m per session to a maximum elevation of 2,700 m.

The altitude simulation device draws in ambient air, separates the oxygen from the nitrogen, and then pumps high-flow hypoxic air into a semiclosed enclosure. Altitudes of up to 6,500 m can be simulated.

The patients had a mean 83-month duration of heart failure. All of them tolerated the treatment sessions without any adverse effects. A mean 91% oxygen saturation was maintained at maximum simulated altitude. Nine of 10 patients showed significant improvement in all three measures of exercise performance (see table).

These results are promising, but need to be confirmed in a larger number of heart failure patients, said Dr. Formica, who had no relevant financial disclosures.