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Left Ventricular Assist Devices Leading to New Options in Heart Failure Treatment

Left ventricular assist devices (LVADs) are prolonging survival and improving the quality of life among patients who receive the devices as a bridge-to-transplantation. In addition, the latest generation LVADs are emerging as an important treatment option for patients with advanced heart failure who are not candidates for heart transplantation.

An LVAD assists in the heart's pumping action, moving blood from the left ventricle into the aorta. The native heart is not removed.

"While LVADs have been around since the '90s, what has changed over the last decade are dramatic improvements in the design and miniaturization of the devices. As a result, they have become smaller, more durable and more reliable," said Nader Moazami, MD, transplant surgeon, Minneapolis Heart Institute®. Moazami joined the Minneapolis Heart Institute®'s Center for Advanced Heart Failure Treatment earlier this year after practicing most recently at Washington University in St. Louis, Mo., which is one of the highest volume LVAD centers in the country.

IMPROVED SURVIVAL RATES AND QUALITY OF LIFE MEASURES

Several large prospective trials have demonstrated the efficacy of the newer LVADs in prolonging survival and improving quality of life for patients waiting for transplant. "We finally have an assist device that makes a marked improvement in patients' lives and dramatically improves the quality of life," said Moazami.

Patients for whom an LVAD may be considered include those with a long-standing history of heart failure who are candidates for heart transplantation. "Among these is a subgroup of patients who are sick enough that we don't have time to wait until a heart becomes available," said Moazami.

Because of the improvements in LVADs, many of these patients have the device implanted and are able to go home until a suitable heart is available.

"The key is that the patients do not need to remain in the hospital. They can go home and be ambulatory. The device is small and noiseless – patients can walk

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Less than two months after receiving an LVAD, Robert Williams was walking 30 minutes a day in his St. Paul neighborhood.

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Treating Non-Healing Wounds with Hyperbaric Oxygen Therapy

Abbott Northwestern's Wound Clinic has three monoplace chambers for hyperbaric oxygen therapy.

Much of a vascular surgeon's practice is directed toward limb salvage, particularly in diabetic patients with occlusive vascular disease, neuropathy and foot ulcers. At Minneapolis Heart Institute® at Abbott Northwestern Hospital, peripheral vascular disease in these patients is aggressively treated with angioplasty and/or bypass, wound debridement, off-loading, control of infection and tight glucose control. The multidisciplinary Wound Clinic has played a crucial role in this effort.

OXYGEN AND WOUND HEALING

here remains a subset of patients whose wounds will not heal despite these efforts. "Changes in the microcirculation of diabetics often interfere with tissue-level oxygen delivery, despite correction of all macrovascular occlusive disease," said Peter Alden, MD, vascular surgeon at the Minneapolis Heart Institute®. Diminished transcutaneous pO_2 levels can diagnose this phenomenon. A similar problem with the microcirculation is seen in irradiated tissues.

A great number of factors are involved in wound healing, and they all depend upon appropriate levels of oxygen in the tissues. In patients with diabetic vascular disease, prior radiation and established bone infections, the tissue oxygen levels are insufficient to allow the normal formation of new collagen and blood vessels that result in a healed wound. "Hyperbaric oxygen therapy can increase the levels of oxygen in these tissues and thus restore the body's natural ability to heal," said Alden.

HYPERBARIC OXYGEN THERAPY

Hyperbaric oxygen therapy, or HBOT, is the delivery of 100 percent oxygen at elevated barometric pressure. In a monoplace chamber, the compressing gas is oxygen; in a multiplace chamber, the air within the chamber is compressed while the patients breathe 100 percent oxygen through a mask. Most wound patients are treated at two atmospheres (ATA), which is the pressure equivalent to submersion in 33 feet of seawater. Oxygen is normally transferred to the tissues as oxyhemoglobin, bound to red blood cell hemoglobin. Hemoglobin saturation is normally more than 90 percent, so there is little capacity to increase oxygen transport by this means. Under hyperbaric conditions, oxygen dissolves in plasma and is delivered to the tissues independent of hemoglobin. At two ATA, tissue oxygen content increases to more than 1,000 times normal. Elevated oxygen levels persist for several hours after a hyperbaric oxygen treatment.

THE PATIENT EXPERIENCE

Wound patients are typically treated for 90 minutes daily at two ATA, Monday through Friday for six weeks. At each treatment, the patient's vitals and ears are checked before the dive. As compression is increased, patients need to clear their ears via the eustachian tube with repeated valsalva maneuvers much as a SCUBA diver would do during descent. Once at depth they relax until ascent, 90 minutes later.

There are three monoplace chambers at Abbott Northwestern's Wound Clinic. These are large clear acrylic cylinders in which the patient lies semi-supine. The hyperbaric attendant sits adjacent to the chamber and is in communication with the patient through

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Specialized Care for Non-Healing Wounds

Abbott Northwestern's Wound Clinic provides comprehensive care for non-healing wounds. It serves patients with:

- diabetes
- poor circulation
- trauma
- failing surgical flaps
- radiation injury
- refractory bone infections
- pressure injury.

The care team includes vascular surgeons, plastic surgeons, infectious disease specialists, podiatrists, nurse practitioners and nurses, many of whom are certified in wound ostomy and continence. A variety of treatment methods may be used, including advanced wound care dressings, growth factors, bio-engineered skin substitutes and hyperbaric oxygen therapy. For more information, call **612-863-3110** or visit **abbottnorthwestern.com** and go to Hospital Services.

Left Ventricular Assist Devices Leading to New Options in Heart Failure Treatment

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down the street and no one knows that they have an assist device," said Moazami. "That's a big change from the earlier devices. These are much more easy to live with."

Some LVADs have also been approved as permanent therapy (destination therapy) for patients with end stage heart failure who are not candidates for transplantation. "This has spurred increased excitement among heart failure specialists," said Moazami.

CONTINUOUS-FLOW DEVICES: SMALLER AND MORE DURABLE

Of particular interest is the latest generation of LVADs. These are continuous-flow left ventricular assist devices that are smaller and more durable than pulsatile volume-displacement devices. A 2007 study published in the New England Journal of Medicine concluded that the continuous-flow pump can provide effective hemodynamic support in patients awaiting heart transplantation with improved functional status and quality of life.

A 2009 study, also in the New England Journal of Medicine, compared the use of a continuous-flow pump with a pulsatile device in patients with advanced heart failure who were ineligible for transplantation. The continuous-flow device had superior survival rates at two years and had less frequent adverse events and device replacements. Both devices significantly improved quality of life and functional capacity.

Complications of an LVAD implant include blood clots, bleeding, infection and device failure. Device improvements and growing clinical experience are likely contributing to improved outcomes. Moazami noted that the broad resources and multidisciplinary expertise of the Minneapolis Heart Institute® are critical in managing patients who receive LVADs. "Even the imaging we need for patients like this requires a special skill set. Also, many of these patients have significant arrhythmia problems, so you must have a top-notch arrhythmia team that can address these issues.

"We are achieving close to 90 percent survival at one year and many patients have done well for several years with these devices," said Moazami. "This is remarkable considering that most of these patients would have died within six months."

As more heart failure patients are treated with LVADs, Moazami expects that primary care physicians will be partnering with heart failure teams to care for patients in their own communities. "The technology has come a long way. We now are capable of having a model in which patients with LVADs go back to their homes and their primary care physicians continue to care for them. At the same time, the heart failure team is available 24/7 to answer any questions or concerns. We need to become more aggressive in identifying patients who will benefit from this life-saving therapy."

Nader Moazami, MD, joined the Minneapolis Heart Institute®'s Center for Advanced Heart Failure Treatment as the surgical director of the Heart Transplant and Mechanical Cardiac Assist Program. Moazami most recently practiced at Washington University School of Medicine in St. Louis, Mo., where he was an associate professor of Surgery and surgical director of Cardiac Transplantation and the Total Artificial Heart Program.

Moazami completed his cardiothoracic surgery fellowship at the Cleveland Clinic Foundation in Cleveland, Ohio. His general surgery internship and residency were done at Columbia-Presbyterian Medical Center in New York, New York. He graduated from Columbia University Medical School, New York, New York. He has extensive post-graduate training in ventricular assist devices.

Read More

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Women and Heart Disease Summit Forges New Partnerships

Cardiologists and other health care providers engaged in women's heart health have entered a new phase in their efforts to close the heart health gender gap.

As highlighted at the Women and Heart Disease Summit in April, it is time to take stock of progress made, identify areas that continue to challenge health care providers and develop strategies for next steps.

More than 200 physicians, nurses, researchers, health educators and others attended the conference, which was sponsored by the Minneapolis Heart Institute®, Mayo Clinic and University of Minnesota and implemented in collaboration with the Minneapolis Heart Institute Foundation.

DESPITE PROGRESS, WOMEN'S HEART DISEASE OFTEN UNRECOGNIZED

According to Ruth Lindquist, PhD, research consultant, Women's Heart Health Program, Minneapolis Heart Institute®, and professor, University of Minnesota School of Nursing, the idea for the Summit took root almost two years ago among the physicians and staff associated with the Minneapolis Heart Institute® Women's Heart Health Program.

Despite the feeling that progress was being made in identifying and treating women with heart disease, the Women's Heart Health Program staff continued to see patients whose stories were variations on a theme: unrecognized symptoms, treatment delays and treatment that didn't address long-term needs of women with heart disease.

"And this is in Minnesota, the state that has the lowest cardiovascular disease death rate in the country. We kept hearing story after story. As a group, we wanted to do something to end the untimely deaths of women from heart disease," said Lindquist.

"Our thought was, let's pull together all the great minds in Minnesota and find some solutions – this has to end," said Shalini Bobra, MD, cardiologist, Women's Heart Health Program. The University of Minnesota and the Mayo Clinic joined the effort, and the Summit achieved a national perspective with presentations by leading physicians and researchers in the field. The conference featured opening remarks by Mary Pawlenty, first lady of Minnesota, and a keynote address by Nanette Wenger, MD, professor of Medicine in the Division of Cardiology at Emory University School of Medicine and past president of the American Heart Association.

ISSUES GO BEYOND MEDICINE AND SCIENCE

The conference was unusual in several respects. For one, it was designed to engage audience participation, allowing attendees to share information and insights and culminating in a half-day working session to identify next steps.

It also went beyond a traditional medical conference to encompass a range of disciplines and concerns, including cardiology, primary care, nursing, research, research funding, public policy, epidemiology, sociology and health insurance. "We wanted more than just the clinical perspective – we wanted to make connections with people who have different insights and who may have different approaches to address the problems." said Elizabeth Grey, MD, cardiologist and director, Women's Heart Health Program.

The conference presentations and working sessions focused on four areas: national community initiatives to raise awareness of heart disease in women, symptom recognition and delays in treatment, closing the survival gap by addressing gender differences and disparities in pathophysiology, treatment and outcomes, and enhancing the patient-provider connection to deliver optimal cardiovascular care to women.

Mary Pawlenty,
first lady of Minnesota

Women and Heart Disease Summit
April 2010

Left to right: ***Kevin Graham, MD****, president of Minneapolis Heart Institute®;* ***Elizabeth Grey, MD****, director of Women's Heart Health Program, Minneapolis Heart Institute®;* ***Sharonne Hayes, MD****, director of Women's Heart Clinic, Mayo Clinic.*

Briefs

Miracle on Ice: Therapeutic Hypothermia for Cardiac Arrest Patients

Thursday-Friday, Sept. 9-10, 2010

Allina Commons at Midtown Exchange, Minneapolis, Minn.

This conference is devoted to the fundamentals of establishing and further developing a program to treat comatose patients following cardiac arrest. Case presentations and lectures will be made by physicians from the Minneapolis Heart Institute® at Abbott Northwestern Hospital and other national experts. Target audience includes cardiologists, interventionalists, critical care physicians, emergency physicians, EMS directors and physicians, and appropriate department nursing and administration staff. For information and to register visit: **miracle2010.eventbrite.com**.

PROGRAM

For cardiovascular patients who need to be seen quickly, follow these three easy steps:

1. Call Minneapolis Heart Institute® at 612-863-3900 or 1-800-582-5175. Reference "**1-2-3**."
2. Minneapolis Heart Institute® will call the patient within **1 business hour** to schedule an appointment.
3. The patient can be seen at one of these locations within **23 business hours**:

Minneapolis – Abbott Northwestern's Heart Hospital | Baxter | Crosby | Edina | Plymouth – West Health | Shakopee | Waconia – Ridgeview

The Summit organizers said that one of the benefits of the Summit was the opportunity to meet and collaborate with new partners on areas of mutual interest. For example, one of the working session groups discussed analyzing Minnesota hospital admission diagnoses to learn what impact long-term untreated or undertreated hypertension may be having on women. "Maybe we're not putting enough emphasis on hypertension," said Grey. "That kind of information could shift the direction of community health initiatives.

"Many of our responses need to be community-wide, because the issues are not just about medicine or science – it goes further than that."

PRIMARY CARE AND CARDIOVASCULAR RISK MANAGEMENT

The conference also demonstrated the importance of primary care practitioners in education, risk assessment and risk management. "As cardiologists, we need to provide primary care physicians with consistent information and be available to them when they need help," said Bobra. "The challenge is how do we help them do this within the typical 20 minute office visit. Somehow we have to make heart disease evaluation a priority for women because that is the major cause of death in women."

One idea from the conference is to develop a preventive cardiology training session for nurse practitioners and physician assistants. The training would prepare them to assess cardiovascular risk and manage the lifestyle/behavioral aspects of cardiovascular disease, which account for a significant proportion of disease risk. This may help address the challenges that primary physicians face in providing patients with the follow-up and resources needed for long-term risk reduction and management.

Conference organizers now are collaborating to respond to the ideas generated during the Summit. Discussions for new studies and the mining of existing databases to answer some of the questions that were raised are underway. Organizers also want to partner statewide with other groups and organizations. "We hope to leverage resources and to expand or advocate for the many existing programs that have been successful," said Lindquist.

The Minneapolis Heart Institute® and the Minneapolis Heart Institute Foundation will post a summary of the conference at the Women's Heart Health Program page at **mplsheart.com**.

MINNEAPOLIS HEART INSTITUTE FOUNDATION

PUBLICATIONS: January 1 to April 30, 2010

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Presentation Abstracts

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Treating Non-Healing Wounds with Hyperbaric Oxygen Therapy

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an intercom. Each chamber is equipped with a flat screen TV and headphones, allowing the patients to watch television or movies or listen to music.

"The most common problems are ear barotrauma necessitating pressure equalization (PE) tube placement in about 5 percent of patients and confinement anxiety, which is almost always manageable with reassurance and a mild sedative," said Alden. Pulmonary oxygen toxicity and seizure are described complications, but are extremely rare at the depth and durations of treatment used for wound healing.

WHAT'S THE SCIENCE?

There is a wealth of animal experimentation validating the above-described effect of HBOT on angiogenesis. Randomized, double blind crossover trials of HBOT vs. sham dives for treatment of radiation proctitis show significant objective and subjective benefits occurring with HBOT out to five years of follow-up. Multiple prospective studies of HBOT in the treatment of diabetic foot ulcer demonstrate a dramatic reduction in amputation rate.

The Cochrane Reviews endorse the use of HBOT for both of these conditions. Other indications for HBOT include chronic refractory osteomyelitis, osteoradionecrosis of the jaw and for preservation of marginal flaps in soft tissue reconstruction when the blood supply is marginal.

Minneapolis Heart Institute
ABBOTT NORTHWESTERN HOSPITAL
Allina Hospitals & Clinics

800 East 28th Street
Minneapolis, MN 55407

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EDITOR IN CHIEF
M. Nicholas Burke, MD

MANAGING EDITOR/WRITER
Mary Pat McGinnis

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CME Events

Miracle on Ice: Therapeutic Hypothermia for Cardiac Arrest Patients
Thursday-Friday, Sept. 9-10
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Landmarks in Cardiology
Thursday-Friday, Oct. 7-8
Topics:
- Congestive Heart Failure: Case Reviews
- Electrophysiology Update: Indications and Management of Patients
- Vascular Update: Carotids/AAA/Endovascular
- New Imaging Technologies: CT & MR
- Prevention Update
- Level 2 and Beyond

For information: **612-863-6986** or **kris.flanagan@allina.com**.

Evening of Cardiology (Dates may change)
Thursday, Sept. 23 – Alexandria, Minn.
Thursday, Sept. 30 – Waconia, Minn.
Thursday, Nov. 11 – Grand Rapids, Minn.
Thursday, Nov. 18 – Crosby and Aitkin, Minn.
Thursday, Nov. 30 – Northfield, Minn.
For information: **612-863-6986** or **kris.flanagan@allina.com**.