

The Heart-Mate Ventricular Assist System

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ELE 482

4/12/04

The HeartMate Vented Electric Left Ventricular Assist System is a device that takes over the pumping action of the heart's left ventricle. An alternative to a complete artificial heart, the LVAS is made by the Thoratec Corporation, and serves a number of purposes. The LVAS is used to hold patients over while waiting for a heart transplant, or to strengthen a patient in preparation for major transplant surgery. It is also used in some cases as a permanent heart implant when a full transplant is not an option.

The HeartMate LVAS consists of a blood pump and a driveline. The pump is powered by a small electric motor contained in a flat titanium cylinder, about 4 inches in diameter. It weighs 2.6 pounds. The cylinder has two chambers; one filled with blood, and one filled with air, containing the motor. A flexible polyurethane diaphragm separates the two chambers, and is cycled up and down by the motor. This is how the pumping action is created.

The inner surface of the diaphragm and the inner surface of the blood chamber are textured. This allows the body to form a biologic lining on the inside of the device, similar to the linings of blood vessels, and preventing the formation of blood clots.

The driveline of the device is the connection to a controller unit and battery packs, both of which are outside the body. The system controller is the size of a deck of cards, providing power to the pump through the rechargeable battery unit. The controller also monitors the operation of the pump. Any

abnormalities are reported with warning lights and sounds. The control unit also works with a removable display module. This displays the beat rate, stroke volume, and volumetric blood flow per minute. The display unit is also capable of diagnosing what the alarm condition coming from the controller is, should one arise.

To implant the device, a heart lung machine takes over the duties of the heart and lungs. A long incision is made from the top center chest to the abdomen, and the device is implanted. As is illustrated below, the heart is left more or less intact. The surgery takes 4-8 hours.

After the surgery, a short stay in the ICU is standard. Within a few days, patients are able to leave bed and sit in a chair. Gradually, patients progress to walking around and using exercise equipment. When the patient regains strength, he or she is given extensive training on the function of the device, and is released from the hospital, able to return to work, school, or otherwise normal daily activities.

The HeartMate LVAS has been successfully implanted in over 3600 patients worldwide.

