

Artificial Hearts and Ventricular Assist Devices

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ELE 482

February 9, 2004

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When does a person need a heart transplant?

A heart may be irreversibly damaged by long-lasting heart disease or viral infection. People with long-term heart failure, heart muscle disease, or other irreversible heart injury from coronary artery disease and multiple heart attacks that can't be treated by any other medical or surgical means may be candidates for heart transplants.

When the heart no longer can adequately work and a person is at risk of dying, a heart transplant may be indicated. It involves removing a diseased heart and replacing it with a healthy human heart. Cardiac transplantation is recognized as a proven procedure in appropriately selected patients.

Ventricular tachycardia is a potentially lethal disruption of normal heartbeat that may cause the heart to become unable to pump adequate blood through the body. This would be considered a condition worthy of heart transplantation. However, in recent years, the use of ventricular assist devices (VADs) for treating acute cardiogenic shock has been shown to be efficacious in restoring circulatory stability.

The most common application of VADs has been in cases of postcardiotomy shock. More recently, the usefulness of VADs for the management of refractory ventricular arrhythmia in patients undergoing medical rather than surgical treatment has been recognized.

A left ventricular assist device (L.V.A.D.) is a mechanical pump-type device that is

surgically implanted. It helps maintain the pumping ability of a heart that is unable to effectively function on its own. This device is sometimes referred to as a "bridge to transplant." People awaiting a heart transplant often have to wait for a long time before a suitable heart becomes available. During this wait, the patient's already weakened heart may deteriorate and become unable to pump enough blood to sustain life. An LVAD can assist the weakened heart and "buy time" for the patient.

How does an LVAD work?

A typical type of LVAD will have a tube going into the left ventricle that pulls blood from the ventricle into a pump. The pump then sends blood into the aorta. This effectively "bypasses" the weakened ventricle. The pump is placed in the upper part of the abdomen. Another tube attached to the pump is brought out of the wall of the abdomen to the outside of the body and attached to the control system for the pump. LVADs are typically used for weeks to months.

LVADs are a temporary support system for patients waiting for heart transplants and in some cases *artificial* heart transplants. The AbioCor implantable replacement heart is the first available totally implantable artificial heart. The totally implantable AbioCor is powered electrically via an external power source and has no skin-piercing cables. To date, seven critically ill patients with end-stage heart failure have been implanted with it. Four patients survived beyond 2 months, and two patients were discharged from the hospital. Both enjoyed improved quality of life with frequent social excursions; another patient is about to be discharged. While three patients died, early trials suggest that this device holds promise.