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Heart to Heart

Approximately five million people in the United States today suffer from congestive heart failure (CHF), a disease that might simply be described as a broken heart. Treatment for CHF, depending on its severity, ranges from a special diet, exercise and medications all the way up to a heart transplant. Other heart transplant candidates have hearts that are irrevocably damaged through a viral infection, traumatic accident, coronary artery disease or heart attacks. People become candidates for heart transplant surgery only if their heart disease reaches a point that it can't be treated with other therapies.

At any given time, heart transplant waiting lists contain the names of about 22,000 people waiting to receive one of the 8,000 donor hearts that become available for transplant each year. Many cardiac patients die because the demand for heart replacement surgery far out shadows the supply of available human hearts.

Last October, the Food and Drug Administration (FDA) approved the SynCardia CardioWest Temporary Total Artificial Heart as a temporary bridge for use until a viable heart match can be found. During the FDA study, 80 percent of the patients in need of heart transplant surgery survived on this artificial heart long enough to have their hearts replaced with a donor heart. The artificial heart's design is based on the Jarvik-7 that sustained Barney Clark's life for 112 days back in 1982. Patients with this implanted heart can walk around the hospital while tethered to a small, file-cabinet-sized rolling cart. SynCardia has also developed a backpack battery powered unit that can give a recipient more mobility.

If you remember Barney Clarke, you probably ask yourself whether this type of surgery is worth the effort. I decided to write this column after reading about Bill Wohl. He spent five months on the SynCardia CardioWest artificial heart until he received a donor heart in February 2000. In 2004, he won medals in swimming, cycling and track and field at the 2004 Australian Transplant Games.

During the operation, surgeons replace a person's heart with the SynCardia CardioWest device. Air pressure drives blood through the unit's left and right ventricles. The artificial ventricles each have separate chambers for the air that will push the person's blood. The system mimics a human heart, with blood from one of the ventricles going to the lungs for oxygenation and then flowing back to the heart, before being sent by the other ventricle to the rest of the body. Blood pressure is created artificially through the application of air pressure. The tube drivelines carry air from a small, wheeled console through the person's chest to the artificial heart's ventricles.

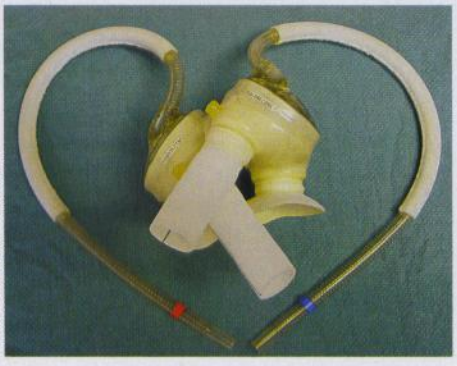

Photo courtesy of SynCardia

SynCardia CardioWest artificial heart

The SynCardia device is clearly only a bridge to human heart replacement. It cannot sustain a person's life indefinitely. Research to develop such a device continues.

The latest FDA-approved study of a permanent artificial heart allowed doctors to implant the AbioCor artificial heart in approximately 15 patients. This heart is completely enclosed inside the body. Its power supply even recharges without the need for a wire or tube hookup to the internal system. A coil on an external battery pack transfers the electrical charge, through the person's skin, to a coil inside the body.

Photo courtesy of AbioMed

AbioCor artificial heart

Patients eligible for the permanent artificial heart study must be very close to death and not eligible for a human heart transplant. Tom Christerson met the criteria to receive a permanent artificial heart. He spent the last 17 months of his life with an AbioCor artificial heart beating in his chest. He died on February 8, 2003, just 6 days short of Valentines Day. Some day, hopefully in the near future, biotechnology will be able to mend one type of broken heart.

Recalling the Facts

1. What is the significant difference between the two heart-replacement systems described in this column?

2. To take part in the FDA AbioCor study a patient needed to be very close to death and not a candidate for a human heart transplant. Why?

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