CardioWest™ temporary Total Artificial Heart

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The human heart is a fist-sized muscle consisting of four chambers: the left and right atria, and the left and right ventricles. The right atrium receives oxygen-depleted blood from the body and delivers it to the right ventricle, which then pumps the blood to the lungs. The left atrium receives oxygen-rich blood from the lungs and delivers it to the left ventricle, which then pumps the blood through the aorta to the rest of the body. Four valves ensure that blood circulates in the proper direction as it is being pumped.

The design of the CardioWest™ temporary Total Artificial Heart (TAH-t) is a technological marvel, yet the heart is elegantly simple in appearance. The size and shape of the artificial heart is designed to fit in the space of the removed diseased ventricles. The device fits in a majority of adults and some larger adolescents. The CardioWest TAH-t utilizes a partial fill and full eject mechanism. As patients exercise, their muscles and blood vessels contract causing more blood to fill the ventricles which is then fully ejected with each artificial heart beat. The TAH-t is able to pump high volumes of blood (up to 9.5 Liters per minute) safely through the body while minimizing contact with non-human surfaces. These design features combined with state of the art surgical and anticoagulation regiments have resulted in good outcomes and have minimized complications.

The power source that the TAH-t uses is an external pneumatic driver that provide pulses of air and a vacuum that make the TAH-t pump blood like a human heart. Two drivers are currently in use with a third driver, an ultramodern universal driver nearing completion of development. The original driver, nicknamed Big Blue for its large size and blue color, is used by hospitals in the United States and Europe. Robust in design, it powers the TAH-t in the Operating Room and is used throughout the patient's hospital recovery until the patient receives a human heart transplant. TAH-t portable driver has been used both in the hospital and for stable TAH-t patients recovery at home. At-home living speeds recuperation, dramatically lowers costs and improves patients' quality of life. The portable driver allows many patients to leave home to shop, visit friends and enjoy a fuller life. This driver is not approved by the FDA for use in the U.S.

In 1982, the world became captivated by the Jarvik-7 Artificial Heart implanted into Barney Clark who lived for 112 days. In the 90’s the device and technology moved to University Medical Center (UMC) and was subsequently renamed the CardioWest temporary Total Artificial Heart (TAH-t). To save the TAH-t, SynCardia Systems, Inc. was formed in 2001 by Marvin J. Slepian, M.D., Richard G. Smith, MSEE, CCE, and cardiovascular surgeon Jack Copeland, M.D.

Today, the CardioWest™ temporary Total Artificial Heart (TAH-t) is the only FDA and CE approved device capable of providing circulatory restoration in morbidly ill patients with irreversible biventricular failure, bridging them to transplantation. In 2004, the TAH-t was named the number one advance in Cardiovascular Medicine by the American Heart Association.

The one year survival rate for patients receiving the CardioWest TAH-t was 70 percent versus 31 percent for control patients who did not receive the device. One-year and five-year survival rate survival rates after transplantation among patients who had received a TAH-t as a bridge to human heart transplant were 86 and 64 percent.