בס''ד

נפלאות הבריאה

successful artificial heart transplants

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Israeli doctors are pumped after country’s first successful artificial heart transplants

Two patients are recovering well after receiving lifesaving procedure, which installs a NIS 2.1 million mechanical heart to allow normal activity until donor organs are available

Israel celebrated its first successful artificial heart transplant at Hadassah Ein Kerem Hospital in Jerusalem on May 25. Four days later, a second successful artificial heart transplant took place at Sheba Medical Center in Ramat Gan.

The Aeson artificial hearts used in the procedures, made by French company CARMAT, have only been employed in 114 such surgeries worldwide.

“This is a great step forward,” said Prof. Rabea Asleh, director of the Heart Failure Unit and the Cardiovascular Research Center at Hadassah Ein Kerem, who performed the May 25 surgery with Dr. Alexander Lipey-Diamant, Prof. Offer Amir and Dr. Amit Korach. “It’s a historical moment.”

The male patients, one in his 50s and the other in his 60s, suffered from biventricular heart failure, which meant that both the left and right ventricles of the heart were not pumping blood effectively.
They were awaiting heart transplants and were at imminent risk of death. With a limited number of heart donors, the artificial heart serves as a bridge transplant — a temporary heart to support the patients until they can eventually get a donor heart. The procurement could take a few months — or even years.

"There simply aren't enough hearts to go around," said Dr. Avi Morgan, surgical director of the Heart Transplant and Artificial Heart Unit at Sheba Medical Center, who performed the second surgery with Dr. Leonid Sternik and Dr. Eyal Nachum. "About 15% of patients on the list, unfortunately, will die waiting for hearts. This artificial heart could save many, many lives."

Each artificial heart cost NIS 2.1 million ($594,900), which was covered by national health funds Clalit and Maccabi at Hadassah Ein Kerem and Sheba Medical Center, respectively.

Avoiding rejection when a heart is on the line

Heart failure is a chronic syndrome that usually occurs as a result of damage to the heart muscle caused by diseases of the heart or arteries.

The Israel Heart Society estimates that there are about 180,000 heart failure patients in Israel, or almost 1.8% of the country's 10.1 million citizens. When heart failure worsens and cannot be controlled through advanced drug therapy or surgical intervention, the option of a heart transplant is considered.

According to data from the National Transplant Center, between 30 and 40 heart transplants are generally performed in Israel each year. Currently, about 97 people are waiting for heart transplants.

In some cases, if both ventricles are failing, patients can undergo surgery to assist one of the ventricles after exhausting other therapeutic options, including pharmacology, pacemaker support, or other devices.

The first successful human-to-human heart transplant was performed in South Africa in 1967. The transplant was successful, but the patient died 18 days later from double pneumonia, a complication of the immunosuppressant drugs needed to prevent organ rejection.

The artificial heart, meanwhile, consists of synthetic polymers and natural materials that the body can accept, with valves and membranes derived from cow heart tissue to reduce the risk of blood clots.

After a human heart transplant, patients are at high risk for rejection of the transplant, but with the artificial heart, there is no risk, Morgan said.

Both teams of doctors and specialists spent several days of training in

“It was a team effort,” said Asleh, who is also the chairman of the Israel Heart Failure Working Group.

Back in Israel, the patients underwent comprehensive evaluations by multidisciplinary teams including healthcare specialists, anesthesiologists, and intensive care staff before the operation.

During the surgery, which took about six hours, the heart was removed and the patients were placed on a heart-lung bypass machine.

“We stop the heart,” Morgan said. “In the meantime, the patient is getting oxygen through the heart-lung machine. It diverts all the blood away from our field so we can work in a bloodless field, and we remove the heart and put in the new mechanical heart.”

Both doctors said the operations went smoothly.

“As surgeons, we see the heart as a pump,” Morgan said. “It has four chambers and four valves and arteries that feed it and veins that drain blood. It is a mechanical pump, which is nice because it makes it feasible for surgeons to be able to replace it.”

Because of the high cost, however, Asleh said that for the foreseeable future, there will be a limited number of surgeries performed each year in Israel.

Smart hearts

“What’s really special about this specific device is that it’s a smart device,” Asleh said. “It can ramp up or ramp down depending on what the patient needs.”

The artificial heart has a power cord that comes through the skin and gets attached to a battery pack that weighs about two kilograms (4.4 lbs).

“It looks like the patient is carrying around a little backpack,” Asleh said. “They can go outside, walk, shop, and go to a park. They can fly on an airplane. They can really do almost everything they want except swim.”

Recipients can shower with a special apparatus that goes over the device and cord, protecting them from the water.

The patients are now recovering in the hospital, where they will stay from four to six weeks, Asleh said, mainly for rehabilitation, learning about nutrition and how to use the device. The patients will then be placed on the waiting list for a human heart transplant.

The longest someone has lived on an artificial heart is two years.

“But there’s no reason to think that the device couldn’t go many years without any device-related troubles because it’s well-engineered with very sophisticated technology,” Morgan said.

Asleh envisions a heart device without a power cord, which, he said, would be “a substantial game changer.”

When asked if having an artificial heart could potentially change people’s feelings, Morgan recounted a story of one of his patients who, after a human heart transplant, claimed that he now had a very special appreciation for flowers, which he had never had beforehand.

“Doctor, have you ever seen this before?” Morgan recounted the patient saying. “I never really liked flowers, but all of a sudden I have this love for flowers.”

“It turned out that the heart came from a person who was a florist,” said Morgan, smiling. “As for an artificial heart affecting people’s likes and dislikes, those shouldn’t change.”