Physicians deactivate heart pump with catheter-based approach

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Donna Jackson's heart, on the verge of failing two years earlier, had made a strong recovery. By spring 2013, she no longer needed the left ventricular assist device, or LVAD, that had been implanted in her chest almost three years earlier. It got in the way of things she wanted to do, like swim with her grandchildren. But her doctors at Stanford Hospital & Clinics believed the 70-year-old resident of the Central Valley would have trouble surviving the surgery to remove the mechanical heart pump. So they decided to find another way.

Their solution—a minimally invasive, catheter-based procedure unlike any previously reported that allows Jackson to live free of the LVAD's batteries, controller and external driveline—is described in a paper published in the August issue of the *Annals of Thoracic Surgery*.

Other minimally invasive techniques to deactivate the LVAD already existed, but they would require small incisions in the chest and the abdomen—more than the Stanford team wanted. "We decided the best thing to do was to use a catheter-based approach because it would involve only a small incision in her groin and the smallest amount of anesthesia possible," said the study's senior author, Richard Ha, MD, clinical assistant professor of cardiothoracic surgery at the Stanford School of Medicine and surgical director of the hospital's Mechanical Circulatory Support Program. The lead author of the paper is Sanford Zeigler, MD, a cardiothoracic surgery resident.

Jackson's doctors threaded a slim plastic tube through a small incision to

her femoral artery in the groin and up to her aorta, allowed them to plug the flow of blood to the LVAD. Then, they cut, cleaned and capped the wiring powering the LVAD so it no longer emerged from an opening in her abdomen. (The LVAD remains inside Jackson's chest.)

Providing inspiration

Jackson returned home from Stanford Hospital five days after the procedure.

She has inspired the Stanford team to begin research on how to predict which LVAD patients might be like her. "If we can find out which patients are going to recover sooner, we can be more aggressive with them so they can be liberated from the LVAD," said co-author Dipanjan Banerjee, MD, clinical assistant professor of cardiovascular medicine and medical director of Mechanical Circulatory Support Program. "And many of these patients will not want nor be able to tolerate a complete removal of the LVAD."

The LVAD's history of clinical performance and evolving technology puts it in a special category of devices whose usefulness continues to develop over time. The U.S. Food and Drug Administration in 1984 approved it as a "bridge" for patients on a path toward needing a heart transplant. Physicians eventually realized that some of their patients did so well with LVAD support that they no longer needed a transplant, and the FDA approved the device for permanent use in 2010. But an estimated 1 to 2 percent of LVAD patients' hearts recover enough to do fine without that mechanical support. Younger patients are able to tolerate the major surgery required to remove the LVAD completely, but the surgery poses major risks for older patients.

To plan the new procedure, Ha and Banerjee consulted with two of the paper's other authors: Philip Oyer, MD, PhD, associate chair of

cardiothoracic surgery, and the first person to successfully use the LVAD as a bridge to transplant; and interventional radiologist Michael Dake, MD, professor of cardiothoracic surgery and medical director of Stanford's Catheterization and Angiography Laboratories.

"You have to have the wire technology and the imaging and a person who knows how to send devices into the difficult areas of the heart and aorta," Ha said. "Dake is absolutely masterful at that."

Completing the circle

For Ha, who met Jackson in 2010 at Stanford Hospital when she was evaluated for heart transplant, the LVAD deactivation completes a circle. "She had come in so sick and the LVAD saved her life, and she was really grateful for that," Ha said. "But, as sometimes happens, people do so well with it, they want to do things they've done in the past."

Jackson has gone back to work 20 hours a week as a notary public. Without her LVAD battery pack and monitor, it was much easier for her to get on a flight to Arizona to visit family. And, best of all, after her surgery this summer, she was able to swim. "I feel better than I have in years," she said.

Provided by Stanford University Medical Center

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