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UCSD tests adult stem cells to repair hearts

End-stage patients taking part in trials

By Terri Somers

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Ronald Ferstadt went ballroom dancing the other night.

A few months ago, the Lomita resident couldn't walk around the block without stopping several times to catch his breath because of the damage to his heart from four major heart attacks.

The former machinist said he's probably feeling better because of the millions of stem cells that were injected directly into his damaged heart tissue at the University of California San Diego Medical Center in Hillcrest. He admits, though, that it could be the placebo effect that's making him feel so good. Ferstadt, 71, is one of 17 patients enrolled so far in a 60-patient clinical trial for end-stage heart disease.

There are no more drugs to help these people. A stent does no good, and valve replacements or bypasses are not valid options. So doctors at UCSD and several other centers around the country have received Food and Drug Administration permission to inject millions of bone-marrow stem cells from a donor directly into heart tissue that has been damaged by heart attacks.

A trial using a patient's own bone-marrow cells to repair angina-causing heart tissue also is under way at Scripps Memorial Hospital in La Jolla. Results of that 180-patient, Phase 2 trial are expected in January.

In Europe, Cytori Therapeutics, a San Diego company, is sponsoring a clinical trial in which its technology is used to pull stem cells out of a patient's own fat. Those cells are then injected into the patient's ailing heart.

The hope is that the stem cells, as well as the growth factors and other chemicals that they secrete as part of the body's healing mechanism, will increase blood flow to the damaged tissue and increase the pumping capacity of the heart.

About 5 million people are admitted to U.S. hospitals annually with heart problems, and 500,000 die every year from heart failure.

For people such as Ferstadt, whose hearts have been damaged through heart attacks, disease, inflammation or chemotherapy, the regenerative promise of stem cells is their last hope.

Scientific research has enabled physicians to correct many heart problems, including replacing faulty valves, unclogging impeded blood vessels or correcting a short in the body's electrical system, said Dr. Anthony DeMaria, the cardiologist running the clinical trial at UCSD. But nothing has been proved to regenerate heart muscle once it has been destroyed or damaged. The only treatments are a heart transplant or artificial pump.

“Neither of those options is very satisfactory, and that is the lure of stem cells,” DeMaria said.

Doctors and stem cell researchers don't know if any of these trials will work, though all of the treatments have shown a benefit in animals. Even if the trials are successful, it could be at least five years before any of these treatments are available to the public.

“We are still at the very beginnings of developing stem cell therapies,” said DeMaria, director of UCSD's Sulpizio Family Cardiovascular Center.

Scientists and physicians know it's likely they will have many failures before they find an effective stem cell therapy to treat heart disease. But they also know they often learn as much from failures as successes.

All of these experimental cardiac therapies involve so-called adult stem cells, which are found throughout the body and play a vital role in healing.

One advantage of these cells is they don't have the ethical issues associated with embryonic stem cells, said Dr. Richard Schatz, the cardiologist running the clinical trial at Scripps.

In the past decade, researchers have discovered many types of stem cells that seem to be effective, said Schatz, who also co-developed the first successful cardiac stent. Yet there isn't enough evidence to prove that these cells are effective in repairing damaged or dead heart tissue, he said.

Ferstadt is confident that the cells are working, although neither he nor his doctors know if he's among the one out of every four trial subjects who's receiving a placebo.

He waited two years to get into this clinical trial.

On Oct. 7, Dr. Nabile Dib, a UCSD cardiologist, inserted a catheter through an artery in Ferstadt's groin and snaked it up to his heart. As a guide, Dib used a photographic map of Ferstadt's heart to locate the damaged tissue.

The science behind this procedure already has advanced. Dib was the lead investigator for the first U.S. cardiac trial, in which stem cells from skeletal muscle were injected into a patient's heart through an open-chest operation.

For Ferstadt, several injections were made with a needle in the catheter. Each delivered millions of stem cells to the damaged tissue.

While stem cells can be found throughout the body, few are thought to be in the heart, and certainly not enough to prompt the kind of regenerative healing needed after a heart attack.

In animal studies, the donor stem cells have shown that they can induce the formation of new blood vessels and new muscle in the heart, Dib said.

But no one is sure whether it's the stem cells causing the reaction because the growth factors and other chemicals they secrete have been shown to increase blood supply to tissue that has been damaged by major heart attacks, Dib said.

The stem cells were provided by the trial's sponsor, Angioblast, a New York City company that collects and grows a specific type of bone-marrow cell from healthy donors. Angioblast is sponsoring the trial in hopes of showing that its stem cells are a safe and effective multipurpose therapy, said Michael Schuster, the company's vice president of operations.

The Scripps trial, sponsored by Baxter Healthcare, uses another type of stem cell taken from the patient's bone marrow. These stem cells, known as CD34 and thought to be one of the most powerful progenitor cells in the body, are separated from the other bone-marrow cells through a technology developed by Baxter.

In the Baxter trial and in the European trial sponsored by Cytori, the cells are injected into the heart via a catheter, just as they were in Ferstadt's procedure at UCSD.

“It took an hour and a half, tops, and I didn't feel a thing,” Ferstadt said. He spent the night in the hospital and went home the next day.

“The third day after the procedure, I could walk a whole block without stopping,” he said. “I thought, 'This is crazy – those cells can't work that fast.' From what they tell me, I should see a big change by three months.”

At Ferstadt's six-month checkup, doctors will take sophisticated images of his heart to create a new map for comparison against the original. They will assess how his life has changed: Is he more active without feeling pressure in his chest or shortness of breath? They also will determine how well his heart is pumping blood to the rest of his body and how hard the heart must work to pump.

Doctors will measure his progress for the next three years.

There is, however, no universal scale on how to judge the success of Ferstadt's progress, nor any of the other clinical trials under way.

“It's like a Rubik's Cube,” Schatz said. “It's very, very complicated, and there's no unifying body telling us how to do it.”

Ferstadt said the measure is a bit simpler for him: “Will I get my life back? Will I be able to play with my grandchildren?”

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