

Blood vessels grown from patient's skin

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DALLAS — Medical experts hope they have found a technique that will someday offer a new source of blood vessels for diabetics with poor circulation and patients needing dialysis.

Scientists from Cytograft Tissue Engineering Inc., a San Francisco Bay-area biotechnology company, reported Tuesday that two kidney dialysis patients from Argentina have received the world's first blood vessels grown in a lab from snippets of their own skin.

"We think this is extraordinarily promising. We think that there are a number of patients who would benefit from tissue-engineered vessels," said Dr. Elizabeth Nabel, director of the National Heart, Lung and Blood Institute, which has poured \$2.5 million into the tiny company's work.

The method doesn't involve stem cells and therefore is not politically or ethically contentious.

It involves taking a piece of skin and a vein, less than a quarter-inch square, from the back of the hand. This tissue snippet is placed in a lab dish and nurtured with growth enhancers that help it produce substances such as collagen and elastin, which give tissues their shape and texture.

Two types of tissue are grown: one that forms the tough structure or backbone of the vessel and another that lines it and helps it to function.

Sheets of this tissue are produced, and are then stacked and rolled into vessels 6 to 8 inches long, said Todd McAllister, a scientist and co-founder of the company.

This takes six to nine months, but faster development should be possible once ways are found to do the work on a commercial scale, said Nicholas L'Heureux, the company's chief scientific officer who invented the method.

Still, that means that only patients whose needs are known that far ahead of time could be considered. The focus now is on diabetics who need dialysis, machines to filter wastes from their blood because their failing kidneys no longer can. They number 285,000 in the United States and double that worldwide.

To enable dialysis, doctors create a shunt, a kind of short-circuit that connects an artery and vein, which is tapped into three times a week for the procedure.

"The problem is, as you puncture that over and over and over, the vessel tends to fail," McAllister said.

Patients often run out of healthy vessels that can be cut out and moved to form a shunt, and synthetic vessels often don't last long and can develop complications.

"Living biological tissues have a capacity to heal ... pieces of plastic don't," McAllister said.

Such problems led scientists to put the first "home-grown" vessels in a 56-year-old Buenos Aires woman in May and a 61-year-old man in September. The feel of them "was very similar to the other vessels" that were present from birth, said the surgeon, Dr. Sergio Garrido.

The woman's new vessel has withstood needle punctures three times a week for six months and the man's, for almost three.

However, Dr. Richard Weisel, a cardiac surgeon at Toronto General Hospital not involved but familiar with the work, said more long-term results are needed before anyone can know whether this is a good solution.

"It certainly has advantages over the synthetic materials we have now," he said. Using those fake vessels, "the long-term results are terrible," he said.

The lab-grown vessels are expected to cost under \$10,000. By comparison, "Medicare pays \$4 billion to \$5 billion annually to maintain grafts (shunts), so it's a huge, huge economic burden," McAllister said.

Other potential uses for the vessels are to prevent limb amputations from poor leg circulation in diabetics, and heart bypass operations where patients don't have good veins or arteries to create new detours around blocked vessels. Suitable vessels aren't available for 10% of bypass operations each year, and one in five is a repeat bypass, increasing the odds that usable vessels have already been tapped for this job.

"Right now there's no alternative," said L'Heureux. "The surgeon will take even poor quality vessels which he would not do if he had an option."

The 40,000 children born with defective blood vessels are other prospects.

The Argentina study will test the vessels in 25 diabetics; another study expected to get underway soon in England will involve 25 heart bypass patients.

Company officials said they would ask the U.S. Food and Drug Administration to allow them to do a study in the United States next year.