

The Cellular Plan

How pancreatic islet cell transplantation could signal an end to type 1 diabetes.

BY JACQUIE MICHELS

EACH YEAR 30,000 PATIENTS, children and young adults, are diagnosed with type 1 diabetes. The number of individuals in the U.S. living with type 1 diabetes now stands at more than one million and is on the rise. While the standard of care to treat diabetes has been insulin therapy, severe complications can require a pancreas and/or kidney transplant. But what if, instead of undergoing a major operation and facing months of recovery, patients could be treated with two injections given under local anesthesia and closed with a Band-Aid?

Donald Dafoe, MD, has been focused on improving treatments for type 1 diabetes since he was in medical school. Formerly chief of transplantation surgery at the University of Pennsylvania and Stanford Medical Center, Dafoe has a goal as director of the kidney and pancreas transplant program at Cedars-Sinai Medical Center: to develop a high volume, high quality pancreatic transplant program, and also to bring the extraordinary prom-

ise of islet-cell transplantation to its full potential in clinical treatment of type 1 diabetes.

Surprisingly, type 1 diabetes patients in Southern California are underserved. “If you consider the number of type 1 patients in the area, and figure in the number of pancreas transplants in this group, Southern California performs dramatically fewer transplants than most of the Midwest. There has been no dominant program in the region, and Cedars-Sinai plans to fill that gap,” Dr. Dafoe says.

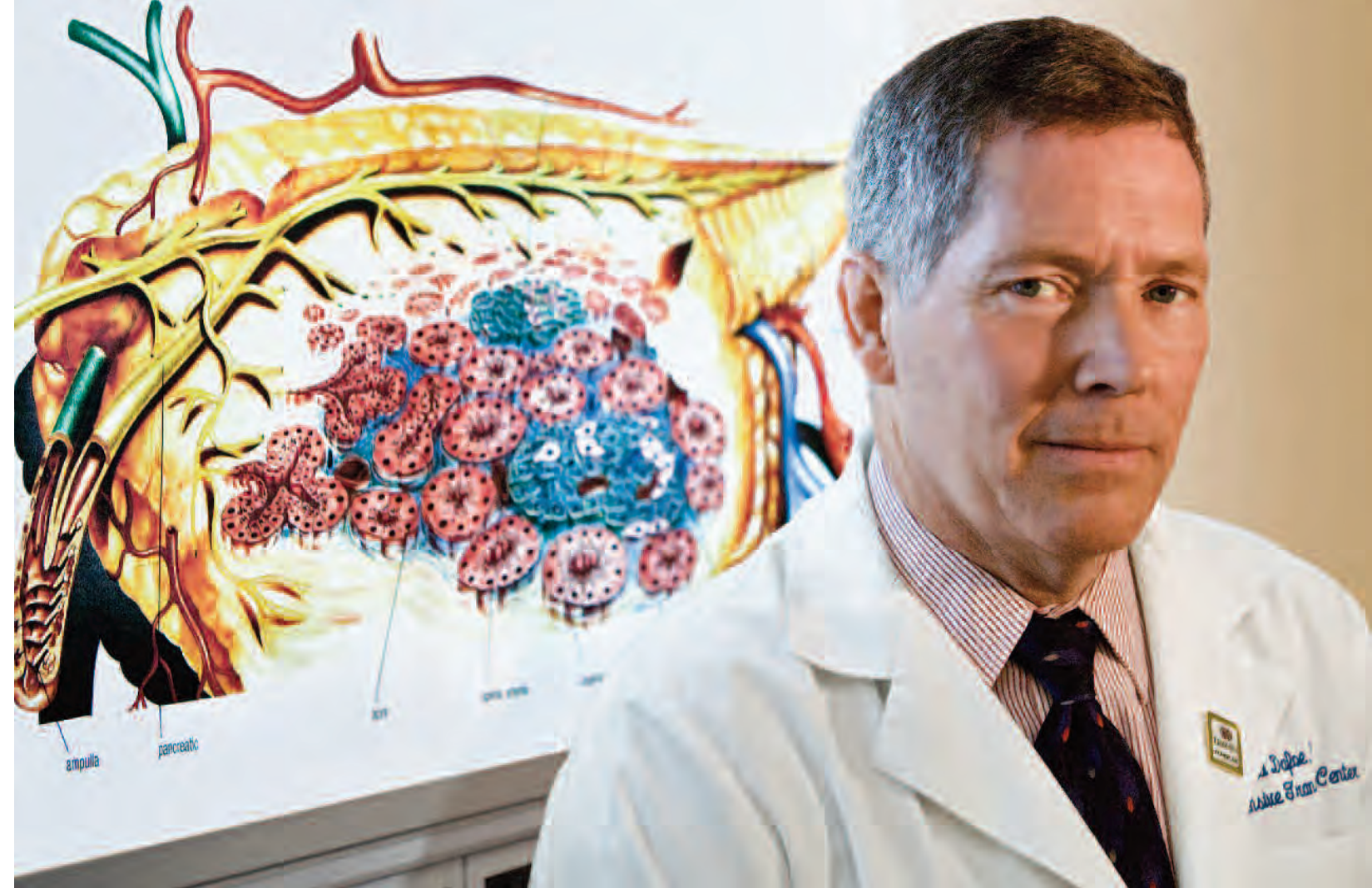
The pancreas is located behind the lower part of the stomach. In addition to making digestive enzymes, specialized cells in the pancreas called islet cells are responsible for producing insulin, a hormone that allows the body to use glucose for energy. There are about a million islet cells dispersed throughout the healthy pancreas.

In type 1 diabetes the patient’s body attacks and kills its own pancreatic islet cells, eventually leaving the patient insulin-dependent. By the

time the disease is advanced, years of uncontrolled blood sugar levels have taken their toll, leaving patients with advanced and serious complications that can include impaired vision, tingling in the hands and feet, vascular disease, which can lead to heart attack and stroke, and kidney failure.

Today, the standard of care for patients with type 1 diabetes and kidney failure is a pancreas/kidney transplant. “When a patient with diabetes needs a new kidney,” says Dr. Dafoe, “ideally we put a pancreas in at the same time. The wonderful thing is that the day after the operation, the patient’s blood sugar levels are normal and they no longer need to inject insulin. The huge psychological burden of constantly monitoring blood sugar is eliminated, and some of the secondary complications can be slowed or even reversed. And 80 percent of transplant patients remain insulin-independent one year out.”

The potential downsides of undergoing a double organ transplant are also considerable. “This is a complex



Dr. Donald Dafoe, director of pancreas transplantation at Cedars-Sinai’s Kidney and Pancreas Transplant Program and Eris M. Field Endowed Chair in Diabetes Research, stands in front of an artistic rendering, painted by one of his patients, of a pancreas and islet cells.

procedure,” explains Dr. Dafoe. “The complications are fewer than in the past, but there is still a chance for serious complications and even death. Pancreas transplantation is largely reserved for patients in whom the severity of their condition justifies the risks of the procedure,” he adds.

“In ten years, I believe we will look back at transplantation as it is now used to treat diabetes and say it was crude,” Dr. Dafoe says. “We are moving to cellular transplants now, and this procedure is almost graceful by comparison.”

The idea of transplanting insulin-producing islet cells into diabetic patients gained attention in the early 1970s, when the procedure proved successful in a rat model. A lot of money and

effort has gone into developing islet transportation, and it is now becoming practical as a treatment option.

“While the treatment is straightforward, the preparation is fairly complex,” Dr. Dafoe says. “First, islet

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cells are procured using an average of two pancreases obtained from deceased donors. This is a delicate process since islet cells are not found in a single site, but are scattered throughout the pancreas.” Cedars-Sinai collaborates with City of Hope, one of seven Islet

Cell Resource Centers funded by the National Institutes of Health, to supply islet cells for transplantation.

Once prepared, the cells are guided via catheter into the portal vein of the liver, an organ rich in blood and

nutrients, where they eventually engraft. Most patients require two injections to complete the treatment.

Dr. Dafoe is careful to point out that islet cell transplantation is not yet perfected. “Among patients undergoing this procedure, 82 percent remain