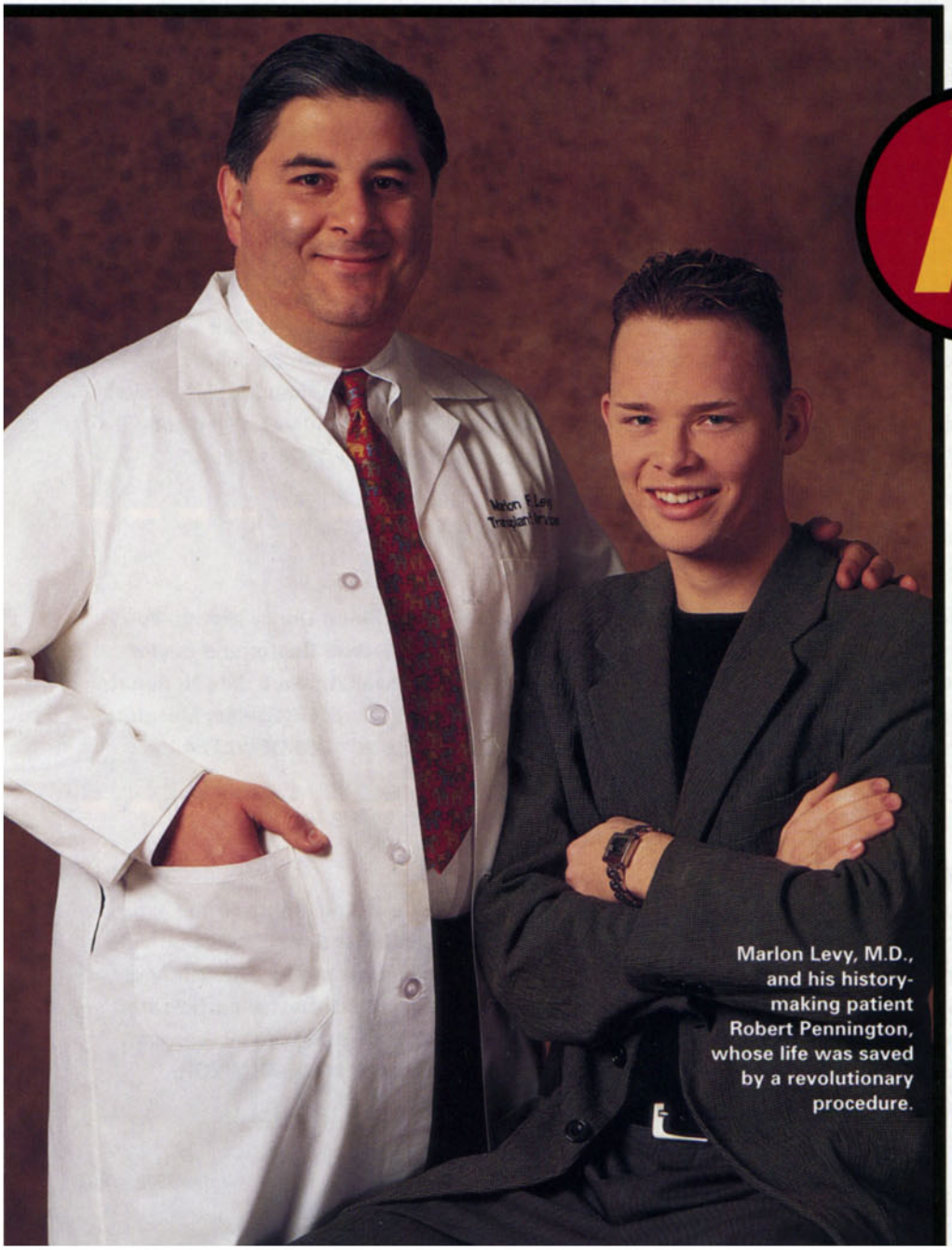
Special Report

Transplantation Breakthrough



Marlon Levy, M.D., and his history-making patient Robert Pennington, whose life was saved by a revolutionary procedure.

BY CAROLYNN DELANY

At Baylor University Medical Center in Dallas, a new technique—in fact, a breakthrough—in lifesaving transplantation science is being researched. This advance, using the liver of a genetically altered pig, kept Robert Pennington, 19, from becoming one of the 3,000 people who die each year waiting for an organ. Approximately 14,000 patients are waiting for a liver transplant and 3,000 for a kidney, a demand far outpacing the supply of human organs.

Pennington's case was very serious. "I knew something was wrong when my eyes and skin were turning yellow, my stomach was bloated, and my urine was the color of coffee," he says. The diagnosis: end-stage liver failure. The only hope: an immediate organ transplant.

A unique research trial at Baylor—called ex vivo (outside the body) liver perfusion—used a genetically altered pig liver to sustain Pennington's life while he waited for a suitable human donor organ.

So far, Baylor is the only institution in the United States to successfully perform this procedure. Marlon Levy, M.D., assistant director of the Baylor Institute of

One Liver Saves Two Lives

Technology upstages the wisdom of Solomon. In a new "split liver" transplant technique, the liver is divided into two lobes, benefiting two patients. The smaller of the two lobes is given to a child and the larger to an adult. In both the child and the adult recipient, the liver regenerates tissue and blood vessels and grows to the appropriate size. Split liver transplants may eliminate pediatric waiting lists.

Last July, a 10-month-old girl and a 49-year-old woman received segments of a single donated liver in separate procedures at Baylor University Medical Center and Children's Medical Center of Dallas. Both patients are doing well.

"The possibility of providing a liver transplant to every child who needs one is revolutionary," says Goran Klintmalm, M.D., director of the Baylor Institute of Transplantation Sciences.

Transplantation Sciences and lead surgeon in Pennington's case, attributes the success of this revolutionary approach to the dedication and professionalism of the research team, administrators and staff. In 1998, the procedure was also successfully performed on a teen-age girl. Says Dr. Levy, "With additional work in this area, I am optimistic that this approach will someday be able to save many more lives."

In the procedure, the pig liver is kept outside the patient's body while the patient's blood is diverted to it. The pig's liver performs the critical and complex work of cleansing the blood of toxins, including many that are natural byproducts of the body's own processes. The blood is then oxygenated and warmed before being pumped back into the patient.

The procedure represents an option of last resort, as Pennington's case illustrates. "There are so many reasons why people may be in need of an organ. If we had an unlimited organ supply we would not need to explore this territory," says Goran Klintmalm, M.D., Ph.D., director of the Baylor Institute of Transplantation Sciences.

But, as the statistics illustrate, the availability of human organs is not likely to rise to match the number of those who need them to live. Given this fact, the success of the ex vivo procedure represents a step toward the possible wider use of pig organs in transplantation. Pigs are easy to breed, and their organs are similar in size and physiology to human organs.

Still, the transplantation of animal organs into human patients—xenotransplantation—is yet to be achieved. Dr. Klintmalm estimates it is 5 to 10 years away from being available. The Food and Drug Administration, doctors and community leaders are all involved in the research to develop the necessary techniques, and weigh all the risks and implications. "Our main goal is to ensure public safety," Dr. Klintmalm says. "It is an arduous process in a very closely monitored environment."

The expected success of utilizing pig organs is based on new technology called pronuclear microinjection, a process that incorporates human proteins into pig tissues. The presence of human genetic material decreases the speed at which the human body recognizes a transplanted organ as foreign, and decreases the risk that the patient's body will reject the organ.

"We were able to offer Robert a highly significant and systematic application of some of these new technologies," says Dr. Klintmalm.

The genetically altered pig liver kept Pennington alive for six and a half hours until a human liver became available. "It's been almost two years now since the operation was performed," he says. He is assessed monthly and his blood is monitored for signs and symptoms of anything that could compromise his health. "I haven't been sick in those two years. And, within reason, I can again do anything anyone else can," Pennington says.

Baylor's community hospitals are also benefiting from the transplantation expertise cultivated at the institute. Dr. Klintmalm and Dr. Levy recently spearheaded the extension of Baylor's kidney transplant program to Baylor Medical Center at Grapevine. Due to the unique care transplant patients require, Grapevine staff were given intensive training as the program ramped up. This included working side-by-side with staff at BUMC, where patient survival rates are the best in Texas, according to the United Network for Organ Sharing. ❑

New Hope for Patients in Dire Need of a Donor Organ