

Penn Transplant Institute



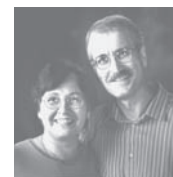
ABOUT LIVING DONOR  
**Liver Transplant**



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*The Penn Transplant Institute provides comprehensive medical and surgical care for patients with end-stage liver disease requiring liver transplantation. Penn's Liver Transplant Program, one of the first in the region, evaluates more than 300 patients and performs more than 100 liver transplants each year, making it one of the largest liver transplant programs in the region and one of the top 10 in the nation. Penn's outcomes meet and exceed the national averages, according to the United Network of Organ Sharing (UNOS).*



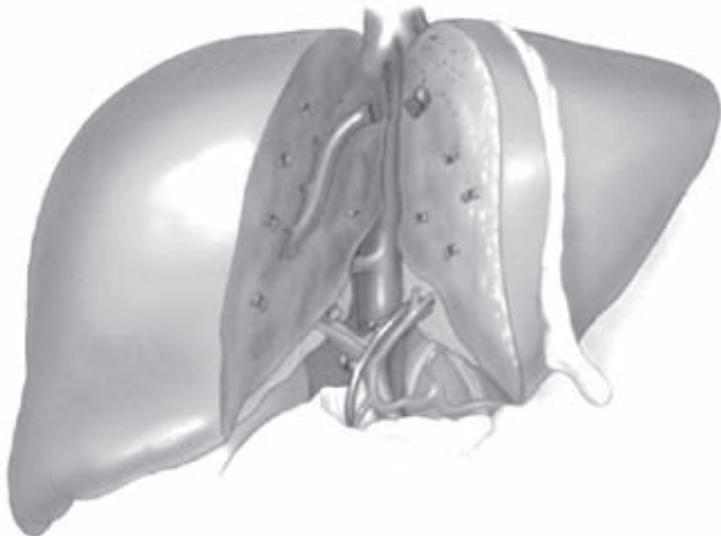
Domenic was suffering from complications of chronic liver disease and knew he would need a new liver very soon. Waiting on the list for several years was not an option for him. He, his wife and children met with the Penn Liver Transplant Team and decided that live liver donation was their only hope. In January 2001, Domenic's wife, Immaculata, donated part of her liver to her husband.

## Introduction

Liver transplantation is an accepted and successful therapy for patients suffering from severe liver disease. As a result, the number of patients awaiting transplant has grown dramatically while the supply of donor livers has not. This has led to longer waiting times, progressive loss of health for those on the waiting lists and a potential increase in the number of patients who die while waiting for a liver transplant.

The anatomy of the liver is favorable for partial donation in that there are specific segments of the organ with their own blood supply that can be easily divided and transplanted into another individual. The liver also has the unique ability to regenerate within weeks after removing a segment. These characteristics of the liver encouraged transplant surgeons to pursue living donation of the liver.

Using living people as a source for donor organs began with kidney transplantation. The earliest kidney transplants were performed between identical twins. In the late 1980s, living donation began to include liver transplantation for children by removing a small portion of an adult liver—usually from a parent—and transplanting it into a child.



The continued shortage of deceased donor livers has led to living donor liver transplantation from adult to adult. In adult living donor transplantation, either a full right side or full left side of a liver from a healthy adult is transplanted into another adult suffering from end-stage liver disease. Appropriate donor selection requires experience on the part of the entire transplant team, including hepatologists, transplant surgeons, psychiatrists, social workers, nurses and transplant coordinators. Successful partial liver transplantation requires skill and technical expertise on the part of the transplant surgeons. This, coupled with protecting the donor's health and welfare, makes adult living donor transplantation one of the most challenging surgical procedures.

One goal has remained in place throughout the development of living donor donation at the Penn Transplant Institute: A deep commitment to the donor's health and safety. Living donor surgery remains the only area of medicine in which a major operation is performed on an individual for whom it is not medically indicated. The risk to the donor is balanced by the potential benefit for the transplant recipient.

The advantages of this approach include:

- Performing the surgery before the recipient becomes too ill.
- Optimizing the recipient's condition before surgery because living donation transplant surgery is scheduled in advance.
- Increased availability of deceased donor organs for recipients who do not have a living donor.

## Who Can Receive a Partial Liver from a Living Donor?

Most of the patients evaluated and found to be acceptable candidates for liver transplantation can be considered for adult-to-adult living donation, but each recipient is evaluated separately. Recipients who may not be candidates for receiving a partial liver may include patients who are overweight, older, have a history of prior abdominal surgery or have associated medical conditions that would require the patient to receive a whole liver rather than a single lobe. A recipient may also be too sick or too well to undergo living donor liver transplantation.

## Who Can Be a Donor?

Donors are usually family members or close friends of the patient requiring a liver transplant. Potential donors should be healthy adults who are carefully evaluated by a multi-member team, including a hepatologist (liver specialist), transplant surgeon, nurse coordinator, psychiatrist and/or social worker to assure that they can tolerate the procedure both physically and emotionally. Donors should have no significant medical problems and no history of hepatitis, liver disease or substance abuse. They must be of the appropriate body and liver size as well as blood type to match the recipient. Potential donors also must be able to understand the procedure, its possible risks and complications, and comply with long-term follow-up.

In order to qualify as a living donor, an individual must:

- Be physically fit and in good general health.
- Have no significant medical problems.
- Be between 21 and 50 years old.

Gender and ethnicity are not considered in determining a match.

## What to Expect During a Donor Evaluation

Although the donor evaluation can be completed quickly under urgent circumstances, it includes several steps and generally takes up to several weeks. First, members of the transplant team, including a transplant surgeon, hepatologist and nurse coordinator meet to discuss the patient's options regarding liver transplantation.

If a potential donor is identified, the screening process begins with a health survey. This is followed by numerous tests to confirm that the donor and the recipient are a good match, including:

- Blood work, to make sure the donor and recipient have the same blood type.
- General lab screening for evidence of liver dysfunction, hepatitis or other medical illness.
- A chest X-ray and electrocardiogram.

Many potential donors are inappropriate candidates for a variety of reasons, including blood type, medical issues and psychosocial issues.

To determine any underlying medical illness, the potential donor meets with a transplant psychiatrist and social worker in addition to receiving a thorough medical exam. If there are any abnormal findings in the initial screening process it may be necessary to refer the donor for additional medical testing.

Next, several imaging studies determine whether the size and blood vessels of the donor's liver are favorable for donation. The first test is usually a magnetic resonance imaging (MRI) scan of the liver, its blood vessels and the bile ducts. The test takes approximately two hours and the potential donor must lie still in a relatively small, enclosed space. At Penn, experienced radiologists estimate the size of the liver lobes as well as the size and branching of the blood vessels.

If the results of the MRI are favorable, it is followed by an angiogram. In this procedure, a catheter, or hollow needle, is inserted through a blood vessel in the donor's groin and guided into the vessels leading to the liver. Dye is injected through the catheter, providing the transplant surgeons with a better picture of the blood vessels. This procedure may be uncomfortable and can take one to two hours. The donor remains under observation in a recovery area for six hours following the procedure.

Many donors require a liver biopsy to determine the suitability of the liver tissue for donation. This procedure takes about 10 minutes and may involve some discomfort. The small incision can be covered by an adhesive bandage. The donor is kept under observation in a recovery area for several hours following the biopsy.

Once the evaluation is complete a surgery date is chosen. Potential donors donate one to two units of their own blood to have available during the procedure. Prior to the actual surgery, the donor meets again with the transplant surgeon to go over the procedure in detail and to sign the surgical consent. An anesthesiologist also speaks with the donor at this time.

At any point during the evaluation information may be uncovered that makes the potential donor a poor candidate for the surgery. If this happens, the evaluation is stopped and the donor and the recipient and family are informed. The donor may also withdraw from the evaluation at any time if he or she decides not to proceed with donation.

Required consultations for donors include:

- Transplant surgery
- Hepatology
- Social Work
- Psychiatry
- Cardiology
- Anesthesiology
- Independent donor advocate

## Required Donor Studies

Study/Procedure	Reason for Test
Blood Type	To determine appropriate match for recipient
Blood Tests	To look for abnormal liver results, screen for previous exposure to hepatitis, determine blood count before donating blood to look for abnormal results
Chest X-ray	To look for abnormal results
Electrocardiogram	To look for abnormal results
Echo	To determine heart function
Physical Exam	To ensure donor health
MRI	To evaluate liver size and look for abnormalities
Angiogram	To evaluate the anatomy of the blood vessels to the liver
Liver Biopsy	To determine if liver tissue is favorable for donation

## The Procedure

The day before the procedure, the donor is allowed to drink only clear liquids and undergoes a preparation that empties the bowel as much as possible. The donor is admitted to the hospital early in the morning on the day of the transplant surgery. Usually, the donor is taken to the operating room two to three hours before the transplant recipient.

An IV line is placed in the donor's arm to supply fluids and medication. An epidural catheter, a small tube through which medication is given, is inserted in the donor's back to help control pain during and after the surgery. Following this preparation, the donor is put to sleep under general anesthesia. The donor's incision is shaped like a hockey stick, extending from the breast bone to under the right ribs.

The entire donation procedure takes six to eight hours, longer than typical liver surgery, in order to coordinate with the recipient surgery. Once the surgery begins, the donor's liver and bile ducts are inspected, the gallbladder is removed and a study of the bile ducts (cholangiogram) is performed. If the liver segment, blood vessels or bile ducts do not seem appropriate for transplantation the procedure is stopped. If everything appears as expected, the recipient is taken to an operating room.

After the recipient's diseased liver is removed, the lobe of the donor liver is removed and transported to the recipient where it is transplanted.

When the operation is complete, the donor remains in the recovery room for several hours for observation before being taken to the transplant floor. The donor has an IV catheter in the neck, two drains coming from the abdomen and a nasal gastric tube to keep the stomach empty. Pain medication is administered through the epidural catheter and by IV.

The first day following the surgery the donor is helped out of bed. The nasal tube draining the stomach contents is removed on the first or second day after surgery. The urinary catheter used to drain the bladder is usually removed two or three days post-surgery. By the second or third day following surgery the donor is drinking liquids, returning to a regular diet as soon as it can be tolerated. The donor is usually discharged five to seven days after surgery. Before being discharged, the donor's pain is controlled by pills and he or she is eating a regular diet, walking in the hallways and most of the drains have been removed. Often donors go home with one drain in place that is removed at the next office visit.

## Postoperative Follow-up

It is recommended that donors request a three-month leave following the surgery, although most find they are able to return to work sooner. The donor returns to the Penn Transplant Institute for two or three visits in the first month after surgery. These visits include physical exams by the nurse practitioner and surgeon as well as lab testing. CT or MRI scans are performed three months after the surgery to determine how the liver is regenerating. Usually, most of the liver that was removed during the surgery grows back in the first month.

As part of an ongoing national donor registry, Penn occasionally requires data from donors for long-term follow-up. This data may include phone calls, doctors' visits, lab tests and imaging studies.

## Risk to the Donor

The majority of the adult-to-adult living donor liver transplants involve removing the liver's right side. This represents approximately 60 percent of the entire liver mass; however the remaining liver can grow back to normal size and return to normal function quite quickly following surgery. The specific risks are similar to other major surgical procedures of the liver, including:

- Bleeding and infection.
- Complications from general anesthesia.
- Complications of the bile duct, such as bile leaks that require re-operation or scarring of the bile ducts that may require future surgery.
- Common risks associated with blood transfusion.
- In extremely rare cases, inadequate return to function of the liver, possibly leading to the need for a liver transplant.
- A less than 1 percent risk of death.

Present experience proves living donor liver transplants can be performed with a low complication rate. However, there are not yet enough results from long-term follow-up to accurately predict risks and outcomes. Studies from transplant centers around the country show that 20 to 30 percent of donors may have minor complications, but very few suffer serious complications following the surgery.

*The Penn Liver Transplant Program's specialized team of transplant surgeons, physicians and nurses are dedicated to donor surgery and committed to returning the donor to a fully functioning, healthy life.*



