

Living Donor Liver Transplantation

This information is for those individuals who are considering donating a portion of their liver to a family member or close friend. This information should supplement discussions with the doctors, nurses and coordinators who are involved in your care. It is very important that you fully understand the risks involved and how donating a portion of your liver may affect you and your family. Our staff is available to answer any questions you may have with regard to donating part of your liver, as well as to explain any procedures and test results. Please do not hesitate to contact the Transplant Team members at any time if you would like more information about living liver donation.

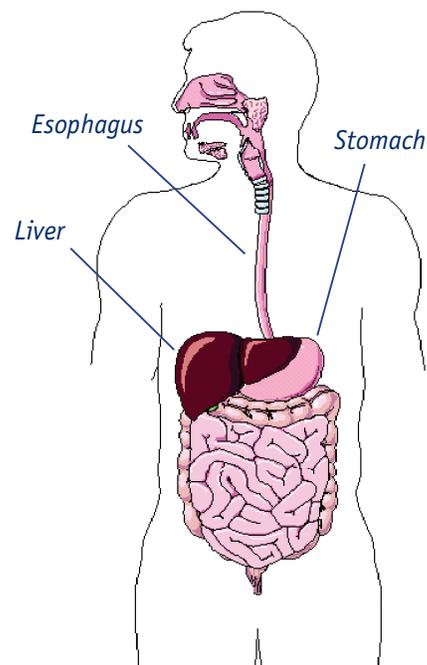
The Normal Liver

The liver is the largest solid organ in the body and plays a vital role in regulating many life processes. In an adult the liver weighs about three pounds and is roughly the size of a football. It is located in the right side of the abdomen and is protected by the ribcage.

The liver is a very complex organ that does a lot of things that are necessary to keep us alive. The liver is a factory for proteins that are used throughout the body. These proteins include the blood factors that are necessary for normal blood clotting. It is also a storehouse for energy, vitamins and nutrients. The liver makes bile, a yellowish green fluid, which is needed for digestion and absorption of food and vitamins, and finally, the liver also purifies the blood by breaking down and removing many medicines and toxins such as alcohol.

A healthy liver also has an amazing ability to regenerate itself. When a portion of healthy liver is removed, the liver grows back to its original size within a month. No other organ (except the skin) is able to regenerate in this way.

Human beings are born with more liver than they need to live. When patients have tumors or other diseases in the liver that can be treated by removing a portion of the liver, up to 80% of the liver can be safely removed.



Liver Failure and Transplantation

Liver failure happens when the liver is unable to perform its normal functions. A diseased liver can result from a sudden failure (acute) as a result of an infection or a drug or toxin reaction, or it may result from gradual failure due to a large number of long-term (chronic) diseases. Causes of chronic liver disease include hepatitis B, hepatitis C, alcohol abuse, primary biliary cirrhosis (PBC), primary sclerosing cholangitis (PSC) and others. Some liver diseases are inherited including, Wilson’s disease, alpha-1-antitrypsin deficiency, and hemochromatosis. Finally, in many cases it is not possible to determine the cause of chronic liver failure. These patients are said to have “cryptogenic cirrhosis.”

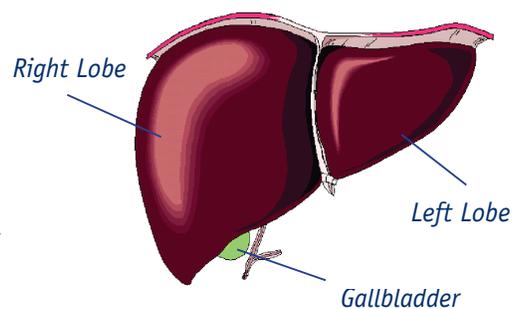
A liver normally has a wonderful ability to heal itself and can overcome many insults it encounters on a short-term basis. However, occasionally the liver is so damaged by the insult that there are not enough cells left to regenerate and scar tissue forms in the liver. When most normal liver tissue is replaced by scar tissue, the liver is said to be cirrhotic and a liver transplant may be the only effective treatment.

Unlike other organs, there is no suitable replacement for a failing liver. Patients with kidney failure can get by with dialysis, and an artificial heart is available for patients with heart failure. At the University of Michigan and around the world scientists are working to develop a method to help patients with liver failure survive until they can receive a transplant. At this point, the dream of artificial liver has not yet been realized.

Living Liver Donation

Each year more than 25,000 Americans die from complications of chronic liver disease and cirrhosis. As of February 2011 there were 16,101 persons awaiting a liver transplant from a deceased donor or “brain dead” donor in the United States. At the University of Michigan alone, there were 166 patients waiting. Unfortunately, in the year 2009 only 6,101 such liver transplants were performed in the United States. Because of the severe national organ shortage, alternative solutions to using deceased donors have been sought. Living liver donation is one of those solutions that has proven to be successful.

The first living donor liver transplant in the United States was performed in 1989. Since that time, more than 4,000 living donor liver transplants have been performed in this country. Many of these procedures have been done in small children, using a smaller portion (usually a portion of the left lobe) of the liver. However, because of the growing need for adult livers, much larger portions have been removed (total right and left lobes) for transplantation.



A Healthy Liver

There are several advantages for a transplant candidate receiving a living liver transplant as opposed to receiving a liver from a deceased donor. The major advantage is that the transplant can occur before the patient becomes too ill to survive transplantation or dies. The chance of dying before getting a chance for a liver transplant from a deceased person is approximately 10-20% today. Thus, up to one in five patients who are placed on the waiting list for a liver will not survive to receive the life-saving transplant. Another advantage of living donor liver transplantation is that it can give patients the chance to receive a transplant before the onset of life-threatening complications of their liver disease. Since these complications decrease the chances of surviving the transplant, living donor liver transplantation may provide patients with a better chance of surviving after transplantation. Examples of complications that can happen while waiting for a transplant include kidney problems and intestinal bleeding. Finally, another advantage to the living donor approach is the emotional satisfaction donors share with recipients when a life of a loved one is saved.

Although it is relatively safe, the operation does involve certain risks, including death. Unlike living kidney donation, where death related to the operation is rare, there have been donor deaths reported after living liver donation. This is a major operation and it should be discussed thoroughly with your family and primary care physician as well as with the Transplant Team. All of the risks will be explained to you in greater detail at the time of your clinic visit so that you can make an informed decision regarding donation. In addition, you will be able to find out exactly how many patients the University of Michigan has transplanted using the living donor method and how the donors and recipients are.

The Living Donor

Parents, children, siblings, other relatives as well as in-laws and close friends can be considered a living liver donor. The potential donor and recipient must have compatible blood types, the donor must voluntarily offer to donate and he or she must be in excellent health. Individuals with a history of high blood pressure, diabetes, heart disease or liver disease will not be considered as donors because of the potential health risks. Obesity and prior abdominal surgeries may also exclude a donor because of the increased surgical risk. Donors also must be between 18 and 59 years old. Individuals who smoke or drink should be willing to stop. Potential donors should have their own health insurance.

The Decision to Donate

Being a living donor can be a very rewarding experience. Living donation is a sharing of life, a giving of a part of you to someone who you care about. However, it is also a choice that only the donor can make. It is very normal to have second thoughts regarding the decision to donate and to experience feelings of guilt as a result. The Transplant Team is always available to ensure all of your questions are answered thoroughly and by arranging any additional counseling necessary to help you make your decision. Our responsibility is to protect the privacy and rights of each potential donor. At any time in the process, it is perfectly acceptable to say “no,” regardless of the circumstance. Deciding not to become a living liver donor does not affect whether your loved one has the chance to have a liver transplant from a deceased donor. Remember that the only **right** decision is the one that makes you and your family the most comfortable.

Receiving a Living Donor Liver

For the patient, the living donor operation is very similar to receiving a liver from a deceased person. The recipient’s liver is removed and the new liver section is implanted. The operation usually takes between six and 12 hours to complete. However, there are some differences between receiving a liver from a living donor and receiving one from a deceased donor. First, when a liver is removed from a deceased donor the entire blood supply to the entire liver is removed and transplanted with the donor liver. This isn’t possible when the donor is a living donor and only part of the liver is being removed. For this reason, some patients with abnormal blood vessels may not be able to receive a living donor liver. Secondly, when the donor liver comes from a living person, the amount of liver tissue transplanted is less than the amount of liver from a deceased donor. Patients who are very ill may not do well if they receive less than an entire liver. Finally, some patients are enjoying reasonable health on the waiting list and are not very likely to die before receiving a liver from a deceased donor. A living donor liver transplant is not justified in these situations due to the risk to the donor, and we advise these patients to wait for a liver from a deceased donor. The decision regarding whether a living donor operation is advisable is determined by the surgeons and liver specialists who care for the patient. This decision can change as the patient’s health changes.

You Should Know

It is important to understand that it is never too late to cancel the operation. If you are having second thoughts about proceeding or if there are doubts in your mind, or in your family’s mind, please let us know so we can address your concerns.

The Liver Donor Evaluation

If you are interested in learning more about donating a portion of your liver to a family member or close friend, you may contact the Transplant Office to speak with Liver Donor Coordinator: Mable Glass (800) 395-6431. We only evaluate a donor if the person they want to donate to is considered to be a candidate for a living donor liver operation. We also only evaluate donors once the patient has been placed on our waiting list for a liver from a deceased donor.

The first step in the process after determining that the patient is a candidate for a living donor liver is to find out if your blood type and the patient's are compatible. If your blood type is indeed found to be compatible, you will first be asked a series of questions regarding your health. If these screening questions do not turn up a medical reason why you should not be a donor, an appointment can be made for you to come to the Transplant Clinic to meet with different members of the Transplant Team. The members of that team include a hepatologist, a surgeon, a social worker, a nurse, a financial coordinator, and a patient advocate who is usually a physician.

Specific issues that will be addressed during your first clinic visit include the donor surgery itself, potential complications of the surgery, post-operative recovery and expectations for returning to work. Each of the skilled health care professionals who make up the Transplant Team take a personal interest in answering your questions thoroughly and taking care of your medical and emotional needs.

Tests and Procedures

Initial Testing

The following is a list of preliminary testing that can be expected in order to determine if you are an appropriate candidate to donate part of your liver:

- **A complete history and physical exam** to evaluate for any abnormal physical findings. It is very important that you be completely honest with us about your health history, any symptoms you are asked about, and about the amount of alcohol that you drink. The results of these evaluations are held confidential; not even the recipient is told what you tell us.
- **Blood studies** will include blood chemistries, blood counts, blood type, immune system function, and tests for certain infectious diseases.
- **Chest X-ray** to determine the health of your lungs and respiratory tract.
- **EKG of your heart** to determine how well your heart is working and if there is any heart disease you weren't aware of.

- **CT Scan** also called computerized tomography is used to check your blood vessels.
- **MRI** also called magnetic resonance imaging uses a magnetic field to produce pictures of your bile ducts.

Additional tests may be necessary depending on your individual medical history.

Once your evaluation is complete the Transplant Team will review your test results at a weekly meeting. If the test results are considered normal we will be in touch with you to discuss scheduling further testing. Abnormal test results may mean that we will have to do more testing or they may prevent you from donating altogether.

Additional Testing

If the team determines that you are a candidate for living donation you will be scheduled for a CAT scan of the abdomen and an angiogram. A CAT scan is an X-ray test that involves lying flat on a table while a machine scans your abdomen. Although it is painless, it is necessary to have an IV for infusion of intravenous dye in order to best see the liver. The CAT scan is done to determine if your liver is healthy, and if the anatomy and size of your liver are appropriate. An angiogram involves placement of a catheter into a blood vessel in the groin area. This catheter is then used to inject X-ray dye into the blood vessels that supply the liver. When the dye is injected, X-rays are taken that show how the blood vessels to the liver are arranged. The surgeons need to make sure that the anatomy of the blood vessels would allow a portion of your liver to safely be donated, without endangering the remaining liver. At times the blood vessel anatomy is not suitable for living liver donation.

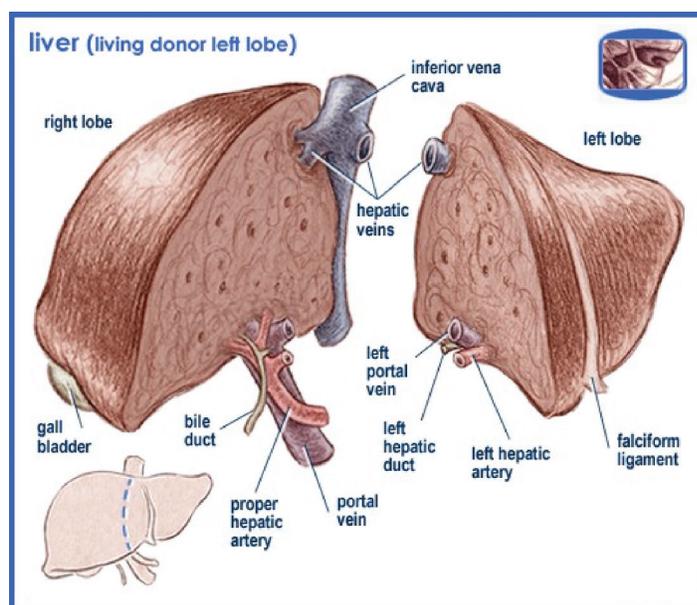
Once the CAT scan and angiogram are done, these tests will be reviewed by the team and you will then be contacted by our coordinators. Keep in mind that you may hear that it isn't possible for you to donate. If everything looks fine, the coordinator will then schedule your operation.



Prior to the actual operation, you will need to come in to our clinic for a final “once over.” During this final visit you will sign a consent form giving permission for the operation. You will have a chance at this point to have any questions or concerns you have answered personally. In order to proceed with the operation, it is necessary that you and the recipient are both feeling well at the time. If either of you has a cold or flu, we will cancel the operation and reschedule it. During this final visit, women who are on the birth control pill may be asked to stop taking this medication prior to the surgery due to potential clotting complications. You also will be asked not to take aspirin or non-steroidal drugs like Advil® and Nuprin for two weeks prior to the surgery.

The Donor Operation

A living donor liver transplant actually involves two overlapping operations between you, the healthy donor, and the patient. The right or left lobe of your liver is removed with its blood supply intact in one operating room (see diagram). While this is happening, the patient's diseased liver is being completely removed in another operating room. The healthy portion of your liver is then taken into the adjacent operating room where it is then sewn into place in the recipient. The donor operation usually takes between four and eight hours.



The right lobe of the liver is about 60% of the liver, and the left lobe is approximately 40% of a normal liver. Because of its amazing capacity to regenerate, your liver is restored to its original size and grows to a comparable size in the patient in approximately four weeks.

Frequently Asked Questions

What Are The Risks of Donating a Portion of My Liver?

The procedure is too new for the exact risk to be known. Living liver donation is a major operation and it should be discussed thoroughly and repeatedly with your family and primary care physician, as well as with the Transplant Team. In addition to the risk of dying from the operation, there are other risks as well. In about 10% of cases, a collection of fluid will develop near the liver because bile leaks from the place where the liver was divided. In these cases a second operation to take care of the problem may be necessary. Other risks include a wound infection, the development of a hernia at the incision, blood clots in the legs and pneumonia. Also, there is a risk of bowel obstruction that can happen later in life due to scarring that results from the operation. This risk is probably about one in 100.

When Will I Be Able to Eat Again?

This varies, some people are able to eat the next day, but others will feel nausea and bloating for several days. During this time, fluids are given by vein.

How Long Will I be in the Hospital?

This also varies from one person to another. On average patients are in the hospital five to 10 days, but occasionally patients may have to be in the hospital for longer, depending on how quickly they recover.

How Will This be Paid For?

Before any donor can be approved, it will be necessary for our financial coordinator to determine that the procedure is covered by insurance. In many cases, donors do not incur any costs related to the evaluation process or the actual transplant surgery. These costs are typically covered by the recipient's insurance company

When Can I Return to Work?

This depends on what you do for a living. Donors who do heavy physical labor need to be off work the longest. Donors who do desk work at home may only need to be off work for two or three weeks. We recommend that donors plan on being out of work for six to eight weeks as you recover at home. You will need to make arrangements to meet your usual financial obligations during this time. During the evaluation process, you will meet with the transplant financial coordinator to discuss these and other related issues.

How Much Does it Hurt?

It is common for donors to experience significant pain and discomfort after the surgery, which may persist for several weeks. Pain medications will be made available to you during your hospitalization to keep you as comfortable as possible. Pain medication does not always take away all of the pain, but you should feel comfortable. It is important to let your doctors and nurses know if your pain is not well-controlled or is worsening over time. The anesthesiologist will discuss the possibility of placing an epidural catheter prior to the operation to help with pain control. This is the same type of epidural that pregnant women sometimes receive to decrease pain during childbirth. Epidural catheters are quite routine and we encourage patients to have them, but the decision is up to you.

What Will the Scar be Like?

The scar runs across the abdomen from side to side just underneath the rib cage on both sides (see diagram). In many cases it also runs up the middle.



Mercedes-Benz Incision

Is a Living Donor Transplant Better Than a Transplant From a Deceased Person?

The results so far across the world show that a liver transplant from a living donor is neither better nor worse than a transplant from a deceased donor. The main reason for living donation is to allow patients to get a transplant earlier than they would have based on the waiting list.

Who Can I Turn to With Questions?

Medical questions should be asked to the nurses and physicians on the Transplant Team. We also have dedicated social workers who are available to answer questions or assist you and your family throughout the donor process. Many potential donors have questions and concerns that come up as they begin the evaluation process. Common issues include worries about financial responsibilities when work time is missed, travel expenses, childcare, housing for family during your hospitalization, and support after surgery during the recovery phase. It is common for potential donors to have some stress and anxiety that goes along with considering donation. Whether one is a family member or friend, the decision to consider donation can raise many conflicting emotions. The Transplant Team is very committed to addressing these concerns in a completely private and confidential manner. The social worker is available to meet with you and your family to talk about any questions or concerns both in the clinic and at any time throughout your hospitalization.

The Operation and the Recovery

Before the Operation

Once the Transplant Team has made a decision regarding your ability to donate, a transplant coordinator will contact you to discuss possible dates for the operation. The transplant coordinator also will make all of the hospital arrangements for your admission on that date.

The day before your surgery a nurse from the hospital will call you between 3 and 5 p.m. to confirm your arrival time at the hospital. You should expect to be in the Surgical Admission Suite on the first floor of University Hospital at 6 a.m. on the day of your surgery. It is important not to eat or drink after midnight the night before your surgery.

If you develop a fever, cold, cough, nausea or vomiting the day before your surgery it is important that you call the Transplant Office and let the coordinator know as soon as possible.

The Day of Surgery

On the day of surgery you should take all of your medications as prescribed, unless otherwise directed by your doctor. You should avoid taking aspirin or medicines that contain aspirin for 10 days prior to your surgery, unless directed to do so by your physician. You should also bring a list of all of your current medications with you to the hospital for your doctors to review.

From the Surgical Admission Suite you will be taken to the Operating Room. You will be under general anesthesia throughout the entire operation and a member of the surgical team will be at your side at all times.

Any family members and friends who accompany you to the hospital can wait in the Patient and Family Lounge where the doctors will speak to them after your surgery is complete.

Waking Up After Surgery

The donor operation typically takes between four and eight hours, but may vary depending on your anatomy and any previous abdominal surgeries you may have had. Once the operation is done, you will be taken directly from the operating room to the recovery room where you will wake up from the anesthesia. From the recovery room, you will then be taken to a hospital bed on the fifth floor. Your family and friends will be allowed to visit during regular hospital visitation hours, which are 8 a.m. to 8 p.m.

Once the pain medication that was given to you for the operation begins to wear off you may have some pain and discomfort. Pain medications will be given to alleviate or minimize your discomfort as much as possible. In most cases, you will have control over the pain medication through a machine that allows you to push a button and get a dose of pain medicine.

You may also notice a tube inserted through your nose that runs through your throat and into your stomach. This tube is only temporary but helps keep the stomach empty and prevents nausea and vomiting.

Also, upon awakening you will be asked to take deep breaths, and to cough and turn to help keep your lungs free from infections.

You also will have an IV line in your arm or neck under the collarbone, which will be used to give IV fluids and medications for the first few days after surgery.

You also may have a catheter inserted into your bladder to drain urine. This catheter may feel slightly uncomfortable, but it is only temporary and will be removed when you are able to get out of bed safely to urinate on your own.

During your stay in the hospital, your laboratory studies, medications, nutritional status and exercise tolerance will be monitored closely. As soon as possible, your nurses will begin teaching you how to care for yourself in preparation for your discharge home.

The Recovery Process and Follow Up After Discharge

You will be discharged from the hospital once your doctors feel you are medically stable. The length of your hospital stay will depend on your individual progress, but donors can typically expect to be in the hospital for five to 10 days. However, you should anticipate being out of work for six to eight weeks after your surgery to allow your body time to continue healing itself properly.

You will need to come back to the Transplant Clinic one week after your discharge for a physical exam and blood work to monitor how your body is adjusting after the surgery. You should also expect to have several appointments over the first 30 days. The purpose of these appointments is to track your progress and detect potential complications as early as possible.



You will need to follow up with your internist or family physician who will make your results known to the Transplant Center at the expected intervals of six months, one year and two years after your surgery. The blood tests being monitored are: CBC with platelet count, PT, PTT and comprehensive metabolic profile. A CT scan is used to check your blood vessels and an MRI is used to take pictures of your bile ducts. You will be required to attend a Liver Transplant Education Class to give you an overview of the donation transplant process.

In addition, you should notify each of your local health care providers of any problems that develop once you are discharged home, and they should be given the number to the Transplant Office in the event they need to contact us to discuss a problem related to your surgery.

When to Notify the Transplant Office

It is important that you notify your transplant nurse coordinator if you develop any of the following symptoms once you have been discharged home:

- A fever of 100.5° or greater
- Shortness of breath
- A cough that produces a yellowish or greenish substance
- Prolonged nausea, vomiting or diarrhea
- Persistent or worsening pain, drainage, redness or swelling at the incision site
- Unusual lightheadedness or weakness

It is also important that you notify your transplant nurse coordinator for any emergency room treatment or hospitalization.