Patient Guide to

Liver Transplantation

TEXAS TRANSPLANT INSTITUTE

www.TexasTransplant.org

Texas Transplant Institute
Liver Transplant Program
8201 Ewing Halsell • San Antonio, Texas 78229
210-575-4837

Introduction

Patients with end-stage liver disease and their families are under tremendous physical and emotional stress. They are confronted by a number of doctors speaking a "medical language" that, at times, may be difficult to understand. But for patients and their families to be fully informed, they must be able to understand many different medical and philosophical ideas.

The liver transplantation team presents these ideas to the patient and their family several times during the liver transplantation evaluation. The following information is the usual talk that occurs between members of the liver transplantation team and patients. This handbook has the most common questions asked by patients about:

The evaluation process

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Donor organ placement

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Specific hurdles following transplantation

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General outcome and complications related to liver transplantation

We hope that this written material will answer questions concerning liver transplantation which may arise.

THE FOUR BASIC QUESTIONS OF LIVER TRANSPLANTATION EVALUATION

When a patient with either acute or chronic liver disease meets with our team of liver transplantation physicians and nurses, four questions are generally asked:

QUESTION 1

How bad is my liver disease?

What is the cause of the liver disease? Do you have certain symptoms? Despite many advancements in the diagnosis of liver disease, the specific cause of liver disease can't be determined in about 10 percent of the patients. The patient can still be evaluated for transplantation.

QUESTION 2

If a liver transplant is appropriate for me, is it technically possible?

In other words, can the appropriate blood vessels of the donor organ be attached to your blood vessels? Are there any other potential problems which might complicate the liver transplant procedure?

QUESTION 3

If a liver transplant is appropriate, are there any medical problems that would make the procedure too dangerous for me?

It is very seldom that these medical problems can not be "tuned-up" so you may receive your transplant.

QUESTION 4

Should the transplant team offer me a new liver, and if so, when?

Considering your social and psychological health, will a liver transplant be likely to provide you a productive and healthy life?

Q&A

How bad is my liver disease?

The severity of liver disease depends on what kind of symptoms you are experiencing and how bad they are. These can be confirmed by a brief physical examination and a few blood tests. Your doctor may have already addressed these questions, performed examinations and evaluated these specific blood tests. If so, we will review your doctor's finding.

There are five symptoms that suggest that your liver disease is life-threatening. Doctors rely on symptoms quite heavily in making decisions about your liver disease. Because normal, healthy patients have about eight times more liver function than they use, symptoms of liver disease that do not quickly improve or disappear indicate the patient's life is in danger. Due to this large reserve in liver function that we all have, liver disease seems to "sneak up" on us with very few "warning" symptoms, until the liver is severely damaged.

We usually begin your evaluation by looking for these five symptoms.

Encephalopathy–This medical term describes an abnormality of brain function that some patients with liver disease may have. The liver controls many aspects of brain function in ways we don't yet understand. The brain problems can be as minor as problems with handling numbers (such as balancing the checkbook) to coma (where the person loses consciousness and has no response to the outside world).

Many times these symptoms can be greatly improved by not eating any red meat or other high protein foods. Your doctor may prescribe a medicine called Lactulose. This sweet-tasting medication, which you take orally from two to four times a day, will cause "loose stools." This drug changes the acid content in your lower intestine (colon) so harmful materials are not absorbed from the gut. It is these substances that make your brain not work as well. The healthy liver filters these harmful substances from your blood.

Ascites–This medical term describes increased fluid within the abdomen (belly). Healthy people have only a few drops of fluid within their abdomen, but patients with liver disease can have as much as a few gallons of fluid within their abdomen. Or the extra fluid may cause swelling in the ankles and legs. If this symptom is not controlled by medications, it can be life-threatening. Doctors usually prescribe medications that will cause you to urinate at a high rate so this fluid is removed from your body. This problem may be caused by the liver failing to make certain proteins which hold water inside the blood vessels and out of your skin and abdomen. Sometimes the liver fails to the point that the blood fluid that is transported to the liver can not be processed so that this water slowly comes out from the surface of the liver and causes ascites.

Variceal Bleeding–This medical term describes bleeding from the esophagus; the tube that carries food from the mouth to the stomach. The blood that comes out of the heart and goes into the intestines, exits from the intestines into the liver through a large blood vessel called the portal vein. If the liver is diseased, the blood cannot pass freely through the liver. Therefore, under the pumping power of the heart, the blood may find alternate routes—like the blood vessels that go through the esophagus. These thin-walled blood vessels can burst under this pressure and cause life-threatening bleeding.

This bleeding can be stopped by sclerotherapy–a treatment in which substances are injected into the blood vessels to seal up the blood vessels during endoscopy. Occasionally, when serious bleeding persists, a large tube with a balloon on its end is placed immediately into the esophagus through the mouth to press against these blood vessels to stop the bleeding (Blakemore tube).

Periodic Infections–Our bodies have a system to keep infections out. This network of body functions is called the immune system. A large part of this immune system lies within the liver, so patients with liver disease can easily get infections. These infections come in the form of skin infections and pneumonia. Patients with liver disease also can get an unusual infection called spontaneous bacterial peritonitis. Spontaneous means "without any cause." Bacterial is a certain type of microscopic "bug" which cause infections. Peritonitis is an infection of the fluid and lining of the inside of the abdomen. The lining of the abdomen is the most sterile part of the body and is closely guarded by your body's immune system. Peritonitis can usually be treated with intravenous antibiotics and requires hospitalization for treatment. This problem is a very grave sign that the liver disease is very far advanced and life-threatening.

Tiredness Syndrome–People with liver disease usually develop progressive fatigue and tiredness. They may be unable to complete assignments at work and may have to quit their jobs. Usually this progresses to the point that they cannot complete household chores. Some patients resort to naps during the day. Eventually these patients become bedridden.

If you have one or more of these symptoms that are not rapidly improving or are not reversible, we consider your liver disease life-threatening. Patients with life-threatening liver disease should be considered for liver transplantation.

If a liver transplant is appropriate for me, is it technically possible? In other words, can the blood vessels of the donor organ be attached to my blood vessels?

The key to this question is determining if the portal vein that goes from the intestines into the liver is open. This can be determined in about five minutes by the use of an ultrasound machine (a painless, non-invasive test). This machine bounces sound waves off the portal vein – a technician can "see" if blood is flowing through it. In about 95 percent of the patients we can confirm that the portal vein is open. Even if this blood vessel is closed, there are ways to remove or bypass this clot to allow blood flow to the new liver during the transplant operation.

Q&A

If a liver transplant is appropriate, are there any medical problems that would make it too dangerous for me?

We usually perform a survey of your body in search of any hidden medical problems. These hidden medical problems can usually be "tuned-up" so that you may be able to undergo the transplantation procedure. This exam is not designed to exclude you from liver transplantation, but rather to discover any unseen disease of other organ systems in your body which might be a risk to the success of your liver transplant.

The liver transplantation operation is long and involves a lot of complicated steps. This procedure can cause substantial blood loss, and it places stress on other organ systems. That's why we need to know even minor weakness of other organs in your body. The middle of a liver transplantation operation is not the time to discover and treat some mild heart ailment which could have been diagnosed and treated before the procedure.

This process often takes the most time and can be frustrating for the patient. It involves evaluating your kidney, lung and heart function, and any other problem which might turn up during your transplant evaluation.

Kidney

We evaluate your kidney function by checking for any history of kidney disease, by looking for symptoms related to the urinary system, and by a few blood tests (some of which may have been obtained by your referring physician). Many times we ask patients to save their volume of urine for an entire day. This volume can be used to determine your exact kidney function.

Some degree of kidney failure is common in patients with liver disease. Severe kidney failure does not exclude you from liver transplantation, as it had in the past. If you are troubled with chronic liver and kidney failure, combined liver and kidney transplantation with organs from the same donor is possible with full return of both organs' functions. It has been long known that liver transplantation produces a change in the body's chemistry that allows other organs to be more easily transplanted. The survival of the kidney in combination with liver transplantation is excellent even when the patient who is receiving the organs has a highly reactive immune system.

Lung

We evaluate your lung function by checking for any history of lung disease such as asthma or chronic bronchitis. We also screen our patients for lung disease with chest X-rays (to exclude pneumonia), arterial blood gas sampling (to determine the amount of oxygen in your blood), and pulmonary function tests (to determine the volumes of air that your lungs can move). Because lung infection is common following liver transplantation, we recommend that patients who smoke and are thinking about liver transplantation quit smoking immediately.

Heart

We evaluate your heart function by checking for any history of heart disease. We have a cardiologist examine you (if you are over 45 and/or if you have risk factors for heart disease) and perform a few screening tests. These tests may include an ECHO (a sound-wave) test that determines the function of the heart valves and your heart's ability to pump

blood through your vascular system, as well as a stress test (a test that determines the electrical activity of your heart when you are under the stress of exercise). If there is any hint of coronary artery disease (disease of the blood vessels that supply blood to your heart muscle), the cardiologist may recommend a heart catheterization (a test in which a catheter is placed through an arm or leg blood vessel to inject dye into the coronary artery.

All these tests will answer the questions: "Are there medical problems that will make it too dangerous to undergo a liver transplantation procedure?" "Are there medical problems that need to be 'tuned-up'?" Neither we nor any other doctor can guarantee that a liver transplantation will not have complications of other organ systems (such as post-transplantation kidney failure), but we can try to find any minor problems in these areas before the procedure. Very few patients are excluded from liver transplantation because of problems with other organ systems.

Should the transplant team offer me a new liver, and if so, when?

Liver transplantation is only offered to patients with life-threatening liver failure. The major reason for this requirement is the fact that liver transplantation has a relatively high risk. Therefore, we will only propose this operation if we think your liver disease will take your life in the next year or so.

The decision as to the timing of this procedure can be the easiest or sometimes the hardest decision to make – depending on the patient. In approximately 20 percent of our patients, we know the natural history of their liver disease quite well. In diseases such as primary biliary cirrhosis (PBC), we often know the order of complications with some degree of certainty, usually within months of their occurrence. But for the majority of patients we see in consultation we cannot predict the course of their liver disease down to an exact time. In these cases, we will give our best opinion as to the course of symptoms and the length of time you have until fatal complications develop. These fatal complications are related to the five life-threatening symptoms of liver disease described previously.

Q&A

What Is The Process of Finding a Donor Liver?

The distribution of donor organs is controlled by an agency called the United Network for Organ Sharing (UNOS). This is a nationwide agency, which is controlled by the United States government. All liver transplantation programs are associated with this agency, and it is illegal for an institution to procure organs from cadavers outside the control of this national organization. The actual process of liver transplantation begins when some unfortunate individual dies but his or her heart is still beating. This is called "brain death." An example is the case of a person who is shot in the head and whose brain is destroyed. This individual has died but his/her heart continued to beat and continues to nourish other organs such as the liver and kidneys. The United States enacted "brain death" laws during the early 1960's to create this category of death and to allow for the procurement of these individuals' organs for transplantation.

Permission is first obtained from the donor's family. Then a team of surgeons and technician are called to remove the organs in the operating room. The blood vessels feeding the liver are flushed with a special, cold preservation solution, and the organs are packed in ice. The donor liver is kept in this state until it is ready to be transplanted into the recipient. The donor is tested for communicable diseases (including AIDS), liver function tests and blood type. Then the organ procurement person checks a list of appropriate recipients for the donor liver and calls the liver transplant center directly.

The decision concerning which donor liver should go into which patient is based on four criteria. These criteria are weighted by a computer program that gives "points" to each recipient based on how well they match the donor and the degree of their medical urgency. The patient with the most points will be offered the liver transplantation. The four criteria are as listed below:

Medical Need – This is the most important factor and given the most points in determining donor liver allocation. "Medical need" means how sick each patient is at the time the donor liver becomes available. Organs are allocated such that "the sickest patient goes first." The degree of sickness or acuity or liver disease is determined by obtaining blood tests periodically which tell the function of the liver.

Several years ago, it was found that the numerical values of these blood tests, when placed in a mathematical equation, would accurately describe the risk of death without liver transplantation. This equation is called the **M**odel of **E**nd-stage **L**iver **D**isease or **MELD**. Three blood tests (bilirubin, prothrombin time and creatinine) are obtained every few days to accurately prioritize liver candidates on the UNOS liver donor allocation list.

Bilirubin is a measure of how well the liver can get rid of bile from the liver, and therefore, how yellow the patient appears. The higher the bilirubin, the more yellow the patient appears.

Prothrombin time describes the ability of the blood to clot. The liver makes most of the components of the blood which allow for appropriate clotting. With worsening liver disease, the clotting ability becomes worse, and the prothrombin time increases.

Creatinine describes the function of the kidneys. With worsening kidney function, the

serum creatinine increases because the kidneys are not getting rid of creatinine, which is a product of all muscle tissue. As liver disease becomes worse, the kidney function also becomes worse.

These blood laboratory values are placed in a mathematical formula which produces a number (MELD score) between 6 and 40.

A MELD score of 6 means that the patient has low-severity liver disease and has many years to live before extremely life-threatening symptoms will intervene.

A MELD score of 40 means that the patient has high-severity liver disease and has only a few weeks to live.

Blood Type – In general, liver transplantation is performed between a donor and a recipient of the same blood type or of compatible blood types. There are only four general blood types (A, B, O and AB). The selection of patient depends on how the donor and recipient blood types match.

Size of the donor and prospective recipient – The newly transplanted liver must fit inside the recipient's abdomen. In general, adult livers are interchangeable except at extreme differences in donor and recipient sizes.

An example would be trying to put the donor liver of a a pro football player (6-foot, 2-inches tall and 250 pounds) into a small lady, 5 feet, 2 inches tall and 125 pounds. In contrast, this small lady's liver could be used in the large football player's abdomen. Therefore, larger adults have a slight advantage in liver allocation. For very young recipients, an adult liver may be "cut down" to size that will fit within their tiny abdomens. This same process can occasionally be performed in extreme situations for a very large adult donor liver being placed into a small adult recipient.

Time on the List – Every month that a patient is on the nationwide liver list waiting for an appropriate donor, the patient gains "points." With all criteria being equal (same medical status, same blood type, and same height and weight difference between donor and recipient), the patient who is on the list longer is offered the donor liver first. Therefore, all doctors who care for patients with severe liver disease should place their patient on this nationwide waiting list as soon into their disease process as possible to gain "points" derived from "time on the list." This aspect follows the thinking of "first come – first served."

Q&A

How Long Do I have To Wait For My Liver Transplantation Procedure?

Because of the slow rise in the numbers of donor organs, the average wait for a donor is approximately 6 to 12 months. Depending on the seriousness of your medical condition, this wait could be more than a year and as short as five minutes. Although the organ placement is heavily weighted to medical need, you do not have to wait behind every "sicker" patient to obtain a donor liver. Almost every day, a donor organ will become available. If all the potential "sickest" recipients are of an incompatible blood type or the recipients' abdominal cavities are too small for the new organ, the donor liver is made available to persons at a lower medical necessity status. Thus, a patient with liver disease may be "called in" from home to undergo transplantation.

How am I going to Pay for this Procedure?

Not only is the liver transplantation procedure one of the most complex procedures, but it is also among the most expensive. The initial hospitalization charges alone are approximately $200,000. Virtually no patient can afford the medical bills for this procedure. Fortunately, over the last ten years, other third-party payers have become involved. These payers include insurance companies, the federal government (through Medicare), and the state government (Medicaid). Before 20 years ago, patients and their family could only "fundraise" to pay for their liver transplantation procedure.

A financial counselor will help you deal with these third party payers. This person knows all the financial aspects of liver transplantation. A patient must receive this consultation before being placed on the nationwide waiting list. Because of the support of the insurance industry and our state and federal governments, no person should be refused liver transplantation because of financial problems. However, many times this hurdle of liver transplantation requires a large amount of work by the patient, the transplant physicians, and especially the financial coordinator. Full cooperation with the financial coordinator will insure prompt resolution of these financial dealings.

The Complications And Major Hurdles Following Liver Transplantation

The chances of survival following liver transplantation are directly related to the patient's medical condition just prior to the procedure. For example, if you come into the hospital "walking and talking" and free of infections, the chance that you will go home and live a fully rehabilitated life-style is approximately 90 percent. If the patient is already in the hospital suffering from infections and requires lung support from a machine, the chance of survival drops to approximately 65 percent. This is obviously better than no chance of survival if liver transplantation were not attempted. In general, the results of liver transplantation are simply not as satisfactory in the "emergency" situation. Therefore, the condition of the patients that apply for transplantation has been so mixed over the last few years that approximately 90 percent of liver graft recipients will live long-term. Of course that means 10 percent will die following this procedure. Death occurs usually within the first six weeks of transplantation. Death is usually due to uncontrolled infections that develop soon after the surgery. In fact, the liver transplant surgeons spend most of their time and energy attempting to diagnose and resolve infection in the early post-transplantation period.

Treatment of infections is in two parts. First, antibiotics are given and/or surgical procedures are performed to rid the patient of infection. Second, the patient's immunosuppression (drug treatment given to curb the immune system) is lowered at a rate determined by the serial biopsies that are obtained from the new liver. If the immune system is not attacking the liver (as seen on the microscopic sections of these biopsies), we lower the dosage of your immunosuppression. If your immune system is "overreacting" toward your new liver, the dosage of immunosuppressive medication is increased. All patients' immune systems do not react alike. Fortunately, each patient's immunosuppression protocol can be custom-designed.

Liver Transplant Procedures

The Seven Hurdles Of The Liver Transplatation Procedures

There are seven key hurdles that the liver transplant patient must clear in order to have a successful procedure.

The Procedure Itself

The liver transplantation procedure is marked by a series of difficult medical and surgical problems. For example, the patient may lose a large amount of blood when the diseased liver is removed and replaced by a new donor organ.

The reason for this blood loss is three-fold. First, the liver makes almost all the blood clotting substances. Without these clotting factors, unchecked bleeding can occur during and after the removal of a liver. Second, the blood in the veins of the abdomen is under a great pressure so more than the usual blood loss occurs when the patient is cut in removal of the diseased liver. Third, the body reacts to the presence of the new liver by initially liquefying all the few clots that previously had formed. This process can last for as little as five minutes or as long as 12 hours. This process is one of the main reasons for the extreme length of some liver transplantation procedures.

During the procedure the patient may also have heart problems when the new liver is re-perfused with blood from the recipient's vascular system. This phenomenon can cause low blood pressure, failure of the right side of the heart and lung failure. Usually, this problem is short-lived and not very severe, but occasionally the heart can be irreversibly damaged by this re-perfusion phenomenon. In these cases, patients have died during the procedure. These patients' hearts simply stopped beating and could not be restarted. Despite these pitfalls, the chance of dying during this procedure is between one and two percent.

There are several reasons for this low rate of operative mortality. First, your organ systems have been thoroughly investigated for problems. Second, our liver transplantation team has more than 20 years of experience with these problems on an almost daily basis. Third, highly skilled doctors and nurses are involved in your care during the procedure – with a broad experience aimed at avoiding these operative problems.

Post-Surgical Bleeding

The second hurdle is bleeding within the abdomen and around the liver graft during the first 24 hours following transplantation. Although the surgeons spend many hours treating each point of bleeding following the implantation of the new liver, bleeding can re-develop following the procedure. This occurs in approximately five percent of our patients. The only treatment is to return to the operating room to remove blood clots and stop any bleeding with sutures. This return to the operating room is not a major setback and does not necessarily lead to other complications.

The Viability Of The New Liver

The third hurdle is to determine the viability of the new liver. In other words, the new liver must function properly immediately following transplantation. Although the patient can be safely transplanted with a donor liver within 16 hours after it is removed from the cadaver donor's body, occasionally (two percent of the time) the new liver does not function. The transplantation team performs tests of liver function during the first 48 hours following the transplantation. If the new liver graft does not

function, another donor liver must be found and re-transplantation must be performed immediately. The few times that this has happened we have usually been able to find a new liver before the patient developed an irreversible coma, but finding another liver "in time" is not guaranteed. This is one of the many risks of this procedure.

Getting Off The Respirator

The fourth hurdle is for the patient to become strong enough to breathe without the aid of a respirator. Liver transplantation patients are especially prone to difficulties with their lungs. First, patients with liver disease usually have decreased muscle mass, so they are not as strong as the average person. Second, the blood replacement during the procedure can temporarily damage the lungs. Depending on the general state of the patient prior to liver transplantation, getting the patient off the respirator after transplantation may take an average of two days, but ranges as long as 60 days.

Infection

The fifth and most important hurdle is infection. For the first month after the procedure, the liver recipient is very prone to infection including pneumonia, intra-abdominal infections, wound infections and systemic viral infections. At any subtle sign of infection, a series of tests will be performed to determine the kind and location of the infection. An exact diagnosis is aimed at starting immediate treatment.

The reasons for this high risk of infections are three-fold. First, patients with liver disease have very poor immune systems often associated with pre-transplantation infections. Liver transplantation does not immediately stop this problem. Second, the long and rigorous liver transplantation procedure produces injury to the patient's immune system, mainly through blood loss and blood replacement. Third, following the procedure the patient is placed on immunosuppressive drugs, so it is reasonable that infections will develop. Fortunately, the new liver can reverse this tendency within a few weeks, and the immunosuppressive drugs can be markedly reduced. The successful liver recipient will be only slightly more prone to infections in the long term, requiring no extraordinary measures to avoid serious infections in association with our "low-dose" immunosuppressive drug therapy. After one year following liver transplantation, the mortality of a liver transplant patient **due to infection** approaches that of the normal population.

Technical Problems

Technical problems include the clotting of the vein or artery feeding the liver (two percent) during the first month following transplantation, or the bile duct from the new liver leaking or getting blocked (eight percent). If the hepatic artery clots the patient often requires re-transplantation, usually within a week or so. Attempts to open the hepatic artery are often unable to produce normal long-term liver function. Bile duct problems can be repaired.

Acute Rejection And Chronic Rejection

Acute rejection always causes patients to worry, but ironically it is easy to treat and rarely causes loss of the liver. This process occurs when the patient's immune system tries to destroy the new liver because it recognizes the new tissue as foreign. Acute rejection can occur in two distinct time periods. The first is the time period between days six and sixteen following liver transplantation. The only other time period for acute rejection is when a

patient does not take his/her immunosuppressive medications. Acute rejection involves the immune cells attacking and spreading into the new liver and trying to destroy it. We diagnose acute rejection by getting a tiny piece of the liver with a needle (biopsy) and examining it, and by checking blood tests that show how the liver is working. Approximately 90 percent of the time, acute rejection can be treated successfully with a few steroid injections. It is very rare that a patient requires re-transplantation for acute liver rejection.

The second form of rejection of the transplanted liver is called chronic rejection. This process causes slow progressive loss of liver function. It occurs usually during the first three to six months following transplantation, and after an episode of acute rejection that could not be controlled by medication. This problem is marked by jaundice (i.e., high bilirubin, with very yellow skin) and is confirmed by a biopsy of the new liver. Although high-dose immunosuppressive drugs can sometimes reverse this problem, re-transplantation usually is required for long-term survival. Currently transplant physicians have no clear understanding as to the cause of this problem, so we have no clear preventive measures. Fortunately, this is a rare problem affecting only four percent of our patients.

Lifestyle Following Liver Transplantation

After discharge from the hospital (after approximately 10 days), you will come to the outpatient clinic every week. We will ask a few questions, give a physical examination, and do a few blood tests. At four months following the transplantation, we perform a more thorough examination, including injecting dye into the tube that runs into your bile duct (usually referred to as the "t-tube"). This is left in during surgery and is usually removed at this time. This procedure takes a few seconds and is painless. A liver biopsy is also performed at this time. After this routine exam, you need to come to the clinic every two to four weeks.

At seven months following the liver transplantation, we perform another thorough examination, complete with blood tests and another liver biopsy. Following this routine exam, we will continue to check you with physical examinations and blood tests every month or two. Many times your own doctor will take over, so it is more convenient for your schedule. Our goal is to return you to your community and to your doctor for long-term follow-up care. At or near the one-year anniversary of the transplantation procedure, we again perform a biopsy of the new liver.

Liver Transplant Procedures

The majority of our patients live a completely normal lifestyle. Most go back to work. The reason for these excellent results may lie in the fact that most of our patients have few medical problems except liver disease. Therefore, once normal liver function is attained, the patients regain excellent health. Another reason is that the level of your immunosuppressive medicines has been dropped significantly. These low dosages make the side effects of these drugs quite tolerable.

Immunosuppressive Medications

Liver transplantation patients must take their immunosuppressive drugs for the rest of their lives. These drugs keep your immune system from destroying your new liver. The monitoring of these drugs for their side effects requires follow up visits to the clinic as scheduled.

The side effects can include tremors in the hands, headaches, high blood pressure and high blood sugars. Most of these side effects can be controlled by lowering the dosage of these drugs, and/or adding other medications to counteract these problems. Usually by one year following transplantation, the dosages of anti-rejection medicines will be so low that the potential for side effects will be minimal.

Tacrolimus (Prograft) is a drug taken twice a day which keeps the immune system organized enough to attack the newly transplanted liver. This drug's most common side effects include higher blood pressure, higher blood sugars, headaches and mild shaking of the hands. This drug is taken for the rest of your life.

Mycophenolic Acid (Cellcept) is a drug taken twice a day to keep the number of certain immune cells at a low level. This drug's most common side effects include nausea, vomiting, diarrhea, and low white blood cell count which can lead to increased infection. This drug is usually stopped within the first few months following transplantation except in patients with very strong immune systems.

Prednisone is a steroid drug taken once a day to decrease the function of certain immune cells. This drug's most common side effects include weight gain, increase blood sugars, increased blood pressure and increased weakening of bones. This drug is usually stopped within the first few months following transplantation except in patients with very strong immune systems.

Other Drugs

Antiacid drugs (Pepcid, Prevacid, Protonix) – Because of the stress of the transplant procedure and the use of prednisone in some patients, there is a tendency for transplant patients to develop an ulcer in the stomach. These drugs counteract problems with acid in the stomach.

Anti-infective (Nystatin, Valcyte, Bactrim,) Because of the tendency for patients to develop infection during the early post-transplant period, several drugs have been developed to defend against these infections.

Nystatin Some patients can get a yeast infection in their mouth or esophagus. The use of the Nystatin during the first six weeks following transplantation usually controls this problem. The drug is usually given only until the infection is controlled.

Valcyte Some patient can develop a specific viral infection from a microbe called cytomegalovirus. This virus lives in almost all adults without any effect but under the high level of immunosuppression given in the early post-transplant period, the virus can cause disease such as diarrhea or pneumonia. The use of this antiviral agent taken for four to six months, usually prevents this infection.

Liver Transplant Procedures

Bactrim – Some patient can develop a specific infection from a microbe called pneumocystis. This microbe lives in almost all adults without any effect but under the high level of immunosuppression given in the early post-transplant period, the microbe can cause disease such as life-threatening pneumonia. The use of this agent taken for four to six months, usually prevents this infection.