

## Overview of Liver Transplant

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### Abstract

**Background:** Liver transplantation has become the treatment of choice for groups of patients with end-stage liver disease or liver failure. The gap between the number of patients who need liver transplantation and the number of donated organs has increased all over the world. Liver transplantation, although now a routine procedure, with defined indications and usually excellent outcomes, still has challenges. Improved graft and patient survival rates have been observed lately.

**Aim:** In this review, we will look into the indications, contraindications, and complications of liver transplantation.

**Methodology:** The review is comprehensive research of PUBMED since the year 1991 to 2018.

**Conclusion:** LT has seen enormous progress over the last 50 years and can currently be considered a true life-saving procedure for patients presenting with liver failure. Much remains to be refined, such as the prevention of complications that are associated with long-term immunosuppression, organ allocation with the aim of improved survival, and the worldwide problem of organ shortage.

**Keywords:** Liver Transplant; Complications; Liver Donors

### Introduction

The success of liver transplantation as treatment for most types of acute and chronic liver failure has led to increased referrals for transplantation in the setting of a relatively fixed supply of cadaveric donor organs [1]. Liver transplantation has become the treatment

of choice for groups of patients with end-stage liver disease or liver failure [2]. The gap between the number of patients who need liver transplantation and the number of donated organs has increased all over the world [3]. Liver transplantation, although now a routine procedure, with defined indications and usually excellent outcomes, still has challenges. Improved graft and patient survival rates have been observed in the last 15 years [4]. Despite all research for this method, the procedure has many complications that require scientific models in order to improve the results [5]. IRI in general which is an important complication from hemorrhagic shock, large resection, and transplant is a dynamical manner with two stages: the local insult on ischemia phase and reperfusion phase with inflammation mediators [6]. Every physician should know the appropriate timing to refer a patient with liver disease to a transplant center to give the same chances to every patient and access the best treatment available. Missing or late referral leading to limited access to surgery should be avoided [7]. Success of organ transplantation needs a large degree of availability of organs. Despite the specific problems in the organs to be transplanted, the gap between organs needed and organs donated makes a major challenge that has been only partially met over the decades [8].

### History of liver transplant

In 1952, in Milan, Italy, Vittorio Staudacher was the first to perform a LT in a large animal model, a canine species [9]. In 1963, Thomas Starzl performed the first three human liver transplants at the University of Colorado, but it was not until 1967 that he achieved 1-year survival. Over the next 15 years, relatively few liver transplants were carried out and the 1-year survival rate was only 30% until the late 1970s and early 1980s, when cyclosporine-based immunosuppression increased the 1-year survival rate [1]. Since the early 1980s, substantial progress has been made in all areas of liver transplantation, including selection of recipients, donor management, operating procedure, immunosuppression, and post-operative liver recipient management [10]. Living-donor liver donation was successfully introduced in adult to pediatric settings and adult to adult settings in 1988 and 1989 [11,12]. The first adult-to-adult living donor liver transplant (LDLT) was performed in Hong Kong in 1993. Five years later, the first LDLT was performed in the United States, and, today, there are over 90 centers that perform LDLT across the country, though most are done in a smaller number of larger volume centers [13]. About 40 years from the first liver transplantation, there have been more than 10,000,00 liver transplantations in the world so far. The survival of liver transplant patients in the first year is approximately 80% to 90%. Results have been gradually improved surgical complications, rejection treatment and untreated sepsis management [14]. Nonetheless, compared to the number of deceased donors, the number of patients in the waiting list for liver transplantation has gradually increased. Patients need better access to the transplantation centre, success in coordinating and developing the transplantation program, screening signs and making better use of donations [15].

### Indications and contraindications of liver transplantation

Cirrhosis accounts for more than 80% of transplants in adults and the most common causes for liver transplantation in the United States are hepatitis C (21%), alcoholic liver disease (16%), cholestatic liver disease including primary biliary cirrhosis and sclerosing cholangitis (17%). Certain signs include infectious hepatitis (hepatitis B, autoimmune hepatitis), metabolic disease (Wilson's disease, non-alcoholic steatohepatitis), hepatic fulmination, and non-metastatic hepatocellular carcinoma [16].

In the past, patients with hepatitis B cirrhosis and high viremia were not eligible for transplantation due to the high risk of recurrence following transplantation, resulting in rapid loss of graft. Infection with chronic hepatitis C virus (HCV) is the leading liver transplant indication in the United States, and the number of transplants for this indication is expected to increase significantly over the next 10 to 20 years. The prerequisites for transplant in most centers for alcoholic liver disease are alcohol abstinence for at least six months and active alcohol dependence treatment before transplantation [17-19].

Fulminant hepatic failure, and the more indolent variant, sub-fulminant hepatic failure, is characterized by the occurrence of coagulopathy, jaundice, and encephalopathy manifested in the absence of chronic hepatic disease. It accounts for 5% to 6% of transplantations. Graft failure with the need for re-transplantation represents a growing number of transplants. The past few years have seen increasingly shorter list of absolute contraindications and a growing list of indications for liver transplantation [20,21].

Specific type of Budd-Chiari syndrome and severe portal vein thrombosis and/or stenosis, previously considered as an anatomical abnormality that prevents liver transplantation, have no longer been contraindicated for liver transplantation. Certain problems that make it difficult or impossible to perform normal end-to-end anastomosis are portal venous thrombosis, sclerosis and size difference between the graft and the portal vein (PV) of the recipient [22].

There are also absolute contraindications of metastatic hepatobiliary or extrahepatic malignancies. A waiting period of 5 years after treatment of a solid organ tumor and 2 years after treatment of a hematological malignancy is recommended for extrahepatic cancers [23].

### Liver donors

Liver grafts can be obtained either from deceased donors (DDs) or living donors (LDs). Living donor liver transplantation (LDLT) has been implemented due to the growing demand for donor organs and the widening gap between resource (deceased donor) and demand (recipient). Nonetheless, a measure like a scoring system in both cases is critical in predicting the outcome after transplantation. The patient's medical reserves must be balanced to withstand a major operation such as liver transplantation and its likely outcome [24].

### Deceased donor

Native hepatectomy usually begins with division of liver ligament attachment, followed by skeletonization of hilar structures (bile duct, hepatic artery and portal vein) to prepare for new liver implantation. Donor liver is surgically prepared on the back table for implantation and then transferred to the operating field. In the following sequence, anastomoses are created between the donor liver and the recipient: suprahepatic IVC, infrahepatic IVC, and anastomosis of PV [25].

### Living donor liver transplantation

A promising approach to addressing donor shortages has arisen from LDLT. The advances in LDLT culminated in the extension of the recipient requirements to include patients previously deemed unfit for LT due to older age or co-morbidities [26]. However, LDLT is a complicated procedure in the point of its technical complexity and different physiological requirements resulting from regeneration of a partial liver graft compared to whole liver graft liver transplantation. What is more, donor safety and biliary complications continue to be a major obstacle in LDLT [27]. Several reports have been discussing about the risk of donor complication in the literature. Lately, a worldwide survey on living donor risk documented the overall donor mortality and morbidity rates were 0.2% and 24%, respectively with the majority of deaths involving right lobe donors [28].

### Complications

Abnormal liver biochemistries are typical during the initial 48 - 72 postoperative hours and reflect a number of insults to the graft, including after harvesting, preservation, and subsequent reperfusion. Nevertheless, daily Doppler ultrasound examination should be carried out to exclude vascular complications such as hepatic artery thrombosis, portal and hepatic vein stenosis or obstruction [29].

Biliary complications are considered the Achilles' heel of LT, particularly in the setting of LDLT.

In the first week after LT, as ischemia and reperfusion damage recovers, liver biochemistry is steadily improving, and the amount of transplanted liver graft is also regenerating. At 1 week and beyond, acute refusal becomes an important and frequent cause of dysfunction of the graft. The confirmatory diagnosis of liver biopsy is required.

There may be numerous infectious complications following hepatic transplantation, and opportunistic infections associated with intense immune suppression are relatively common, such as cytomegalovirus, pneumocystis carinii and fungal infection [30]. Postoperative bleeding is severe in early postoperative hypotension and oliguria differential diagnosis [23].

Rejection may occur within the first few days of transplantation, especially if immunosuppressive therapy for induction is not used. Hepatic biopsy is diagnosed because the clinical signs and symptoms of rejection (including fever, bilirubin or transaminase, malaise, and increased ascites) are highly variable, unspecific, and unreliable [23].

### Conclusion

LT has seen enormous progress over the last 50 years and can currently be considered a true life-saving procedure for patients presenting with liver failure. Much remains to be refined, such as the prevention of complications that are associated with long-term immunosuppression, organ allocation with the aim of improved survival, and the worldwide problem of organ shortage.

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