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**Evolving Trends in Liver Transplantation: Listing and Liver Donor Allocation**  
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The success of liver transplantation in the past three decades as a life-saving procedure for patients with end-stage liver disease has led to the ever-increasing disparity between the demands for liver transplantation and the supply of donor liver organs. Donor allocation and distribution remains a challenge and a moral issue as to how these organs can be equitably distributed. This article reviews the evolution of the liver allocation policy and discusses in detail the challenges clinicians face today in this area of medicine.

**Cardiac and Pulmonary Issues in LT Assessment Candidates**  
Norma C. McAvoy and Peter C. Hayes  

With the incidence of liver disease increasing worldwide, a growing number of patients are being referred for assessment for liver transplant (LT). Unfortunately, the donor pool is not expanding at the same rate, which consequently results in increasing demand on a finite resource. It is therefore imperative that the candidate who undergoes an LT gets maximal benefit with a resultant maximal increase in life expectancy. This article addresses some of the main cardiac and pulmonary issues that may occur in LT assessment candidates.

**Renal Dysfunction in End-Stage Liver Disease and Post–Liver Transplant**  
Marcelo S. Sampaio, Paul Martin, and Suphamai Bunnapradist  

Renal dysfunction is a frequent complication in patients with end-stage liver disease awaiting orthotopic liver transplantation and in the post liver-transplant patient. Although the stereotypical form of renal dysfunction is the hepatorenal syndrome, other causes of acute kidney injury in this population include prerenal azotemia and acute tubular necrosis. Renal injury in a patient with cirrhosis is associated with a poor prognosis.

**Acute-On-Chronic Liver Failure**  
Sumeet K. Asrani and Jacqueline G. O’Leary  

The Model for End-Stage Liver Disease (MELD) has been the single best predictor of outcome of the progression of cirrhosis. Acute-on-chronic liver failure (ACLF) has been proposed as an alternative path in the natural history of cirrhosis. ACLF occurs in patients with chronic liver disease and is characterized by a precipitating event, resulting in acute deterioration in liver function, multiorgan system failure, and high short-term mortality. In this review, the natural course of patients with ACLF, especially as it relates
Hepatitis Viruses and Liver Transplantation: Evolving Trends in Antiviral Management

Elizabeth C. Verna

Viral hepatitis is both a leading indication for liver transplant (LT) and an important cause of posttransplant graft loss and mortality. Treatment and prevention of hepatitis B virus in LT recipients, with the observed corresponding improvement in post-LT outcomes, is among the great success stories in transplantation. By comparison, treatment of hepatitis C virus with safe and effective regimens is only just becoming a reality. Chronic hepatitis E virus infection in LT recipients represents a newly described phenomenon that can also lead to graft loss; early diagnosis and treatment may be key in the management of these patients.

Liver Transplant for Hepatocellular Cancer: Very Small Tumors, Very Large Tumors, and Waiting Time

Kayvan Roayaie and Sasan Roayaie

The role of liver transplant for treatment of early hepatocellular cancer (HCC) is no longer contested. However, its benefit relative to other therapies for patients with very early (<2 cm) HCC is still a matter of debate. Twenty years after the establishment of the Milan criteria, we are beginning to realize that the number and size of tumors may not be the best metric by which to prognosticate outcomes and allocate organs. A better assessment of tumor aggressiveness is clearly needed.

The Adolescent Liver Transplant Patient

Deirdre Kelly and Jo Wray

The rapid development of new diagnostic tests and improved therapy, especially the success of liver transplantation, has changed the outcome for children with liver disease, many of whom survive into adolescence without liver transplantation. The indications for transplantation in adolescence are similar to pediatric indications and reflect the medical advances made in this specialty that allow later transplantation. These young people need a different approach to management that involves consideration of their physical and psychological stage of development. A focused approach to their eventual transition to adult care is essential for long-term survival and quality of life.

Expanded Criteria Donors

Sandy Feng and Jennifer C. Lai

The greatest challenge facing liver transplantation today is the shortage of donor livers. Demand far exceeds supply, and this deficit has driven expansion of what is considered an acceptable organ. The evolving standard has not come without costs, however, as each new frontier of expanded donor quality (i.e., advancing donor age, donation after cardiac death, and split liver) has possibly traded wait-list for post-transplant morbidity and mortality. This article delineates the nature and severity of risk
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James F. Trotter

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Kalyan Ram Bhamidimarri, Thiago Beduschi, and Rodrigo Vianna

Intestinal transplantation is the definitive therapy for patients with irreversible intestinal failure and can be combined with transplantation of other abdominal organs, such as stomach, spleen, and pancreas with or without liver. There is an increasing trend in the volume of intestinal and multivisceral transplantation in the past few decades and there is also increasing trend in patient and graft survival primarily due to improved patient selection, advances in immunosuppression, and improved perioperative management. This review summarizes the various key elements in patient selection, types of grafts, and updates in the perioperative management involved in multivisceral transplantation.

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Ivo W. Graziadei

Many nonviral diseases that cause liver failure may recur after liver transplantation. Although most studies have shown that a recurrent disease does not negatively affect patient and graft survival in the intermediate postoperative course, there is growing evidence that, especially in patients with primary sclerosing cholangitis and in patients with recurrent abusive alcohol drinking, disease recurrence is a significant risk factor for graft dysfunction and graft loss. Therefore, the recurrence of nonviral diseases has become a clinically important and prognostically relevant issue in the long-term management of recipients of liver transplantation.

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Paige M. Porrett, Sohaib K. Hashmi, and Abraham Shaked

Advances in pharmacologic immunosuppression are responsible for the excellent outcomes experienced by recipients of liver transplants. However, long-term follow up of these patients reveals an increasing burden of morbidity and mortality that is attributable to these drugs. The authors summarize the agents used in contemporary liver transplantation immunosuppression protocols and discuss the emerging trend within the community to minimize or eliminate these agents from use. The authors present recently published data that may provide the foundation for immunosuppression minimization or tolerance induction in the future and review
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Michael R. Charlton

Long-term survival following liver transplantation is profoundly affected by conditions unrelated to graft function. Many causes of mortality are contributed to by the metabolic syndrome. The approach to metabolic syndrome in liver transplant recipients requires consideration of transplant-specific factors, particularly immunosuppression. Enhancing long-term outcomes for liver transplant recipients necessitates minimizing the amount of immunosuppression required to prevent rejection. Studies to determine the optimal approach to minimize the impact of metabolic syndrome and complications of immunosuppression in transplant recipients are needed.

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William H. Kitchens, Heidi Yeh, and James F. Markmann

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