

# Contents

## **Foreword: Transplantation of Abdominal Organs** **xiii**

Alan L. Buchman

## **Preface: Gastrointestinal Transplantation** **xv**

Enrico Benedetti and Ivo G. Tzvetanov

## **Living Donor Liver Transplantation: Technical Innovations** **253**

Kiara A. Tulla and Hoonbae Jeon

Living donor liver transplant (LDLT) has found a place to serve the end-stage liver disease community as the donor safety and recipient suitability has been elucidated. Donor safety is of paramount importance, and transplant programs must continue endeavors to maintain the highest possible standards. At the same time, adequacy of grafts based on recipient clinical status via their model for end-stage liver disease score and volumetric studies to achieve a graft-to-recipient body weight ratio greater than 0.8, along with special attention to anatomic tailoring and portal venous flow optimization, is necessary for a successful transplant. Technical innovations have improved sequentially the utility and availability of LDLT.

## **Liver Transplant for Cholangiocarcinoma** **267**

Daniel Zamora-Valdes and Julie K. Heimbach

Liver transplant (LT) for perihilar cholangiocarcinoma (CCA) offers an opportunity for survival among patients with early-stage but anatomically unresectable disease. The 5-year survival rate after LT is 65% to 70%, higher among patients with primary sclerosing cholangitis, who are often diagnosed earlier, and lower among patients with de novo CCA. The results of LT for hilar CCA, along with recent limited data suggesting favorable survival among patients with very early intrahepatic CCA (ICC), have reignited interest in the subject. This article discusses LT following neoadjuvant therapy for CCA and the early data on LT alone for ICC.

## **Immunologic Monitoring to Personalize immunosuppression After Liver Transplant** **281**

Andrew Zhu, Alexandra Leto, Abraham Shaked, and Brendan Keating

Although immunosuppressive drugs have enhanced patient outcomes in transplantation, the liver transplant community has made significant research efforts into the discovery of more accurate and precise methods of posttransplant monitoring and diagnosing. Current research in biomarkers reveals many promising approaches.

**Status of Adult Living Donor Liver Transplantation in the United States: Results from the Adult-To-Adult Living Donor Liver Transplantation Cohort Study**

297

Samir Abu-Gazala and Kim M. Olthoff

This article reviews the Adult-to-Adult Living Donor Liver Transplant Cohort Study (A2ALL). The findings show that the number of adult-to-adult living donor liver transplants is consistently increasing. Living donor liver transplant has an important benefit for patients with acute liver failure, does not compromise donor safety, and has lower rates of acute cellular rejection in biologically related donor and recipient. The conclusions from the A2ALL consortium have been critical in transplant advancement, supporting increased use to help decrease waitlist death and improve long-term survival of transplant recipients.

**Modern Management of Acute Liver Failure**

313

Ruben Khan and Sean Koppe

Acute liver failure is a rare but life-threatening disease that can lead to progressive encephalopathy, intracranial hypertension, and multiorgan failure. In the developed world, the most common cause remains acetaminophen overdose, but there are still many cases in which there is acute liver failure of unknown cause. The mainstay of acute liver failure management remains supportive care in the critical care setting. If supportive treatment does not stabilize the disease process, the patient may require emergent liver transplant. This article summarizes the current management of acute liver failure.

**Intestinal Failure and Rehabilitation**

327

Alan L. Buchman

The rendering of proper care for the patient with intestinal failure requires the provider to have a functional understanding of digestion and absorption, nutrient requirements, and intestinal adaptation. Inherent in those concepts is that not only nutritional absorption but also medication absorption is compromised. The principles of the management of home parenteral nutrition must be mastered, and then proper and controlled weaning of parenteral nutrition may be commenced by use of dietary and pharmacologic means with appropriate clinical outcome measures followed. This complicated management requires a team experienced in both medical and surgical management of intestinal failure.

**Adult Intestinal Transplantation**

341

Cal S. Matsumoto, Sukanya Subramanian, and Thomas M. Fishbein

Adult intestinal transplant differs significantly from pediatric intestinal transplant. Although indications have remained largely consistent since 2000, indications for adults have expanded over the last 2 decades to include motility disorders and desmoid tumors. Graft type in adult recipients depends on the distinct anatomic characteristics of the adult recipient. Colonic inclusion, although initially speculated to portend unfavorable outcomes due to complex host-bacterial interactions, has increased over the past 2 decades with superior graft survival and

improved patient quality of life. Overall, outcomes have steadily improved. For adult intestinal transplant candidates, intestinal transplantation remains a mainstay therapy for complicated intestinal failure and is a promising option for other life-threatening and debilitating conditions.

### **Pediatric Intestinal Transplantation**

355

Neslihan Celik, George V. Mazariegos, Kyle Soltys, Jeffrey A. Rudolph, Yanjun Shi, Geoffrey J. Bond, Rakesh Sindhi, and Armando Ganoza

Pediatric intestinal transplantation has moved from the theoretic to an actual therapy for children with irreversible intestinal failure who are suffering from complications of total parenteral nutrition. Owing to significant advancement in the management of intestinal failure and prevention of parenteral nutrition-related complications that have led to a reduction in the incidence of parenteral nutrition-associated liver disease and improved intestinal adaptation, the indications for intestinal transplantation are evolving. Long-term outcomes have improved, but challenges in long-term graft function owing to chronic rejection and immunosuppressant-related complications remain the major opportunities for improvement.

### **Living Donor Intestinal Transplantation**

369

Ivo G. Tzvetanov, Kiara A. Tulla, Giuseppe D'Amico, and Enrico Benedetti

Living donor intestinal transplant (LDIT) has been improved, leading to results comparable with those obtained with deceased donors. LDIT should be limited to specific indications and patient selection. The best indication is combined living donor intestinal/liver transplant in pediatric recipients with intestinal and hepatic failure; the virtual elimination of waiting time may avoid the high mortality experienced by candidates on the deceased waiting list. Potentially, LDIT could be used in highly sensitized recipients to allow the application of desensitization protocols. In the case of available identical twins or HLA-identical sibling, LDIT has a significant immunologic advantage and should be offered.

### **Endoscopic Follow-up of Intestinal Transplant Recipients**

381

Robert E. Carroll

The growing population of intestinal transplant recipients present a unique challenge to the gastroenterologists responsible for their support and evaluation. Improvements in patient and graft survival are largely attributed to surgical advancements, refined antirejection therapy, and enhanced endoscopic surveillance protocols that better perceive rejection and other complications. This article reviews the endoscopic management and interventions provided for transplant recipients at the University of Illinois Hospital with complications, such as acute rejection, ischemia, bleeding, fistula, posttransplant lymphoproliferative disorder, and gastroparesis. Further research is needed on promising strategies currently used for related diseases to treat and sustain the intestinal graft.

**Composite and Multivisceral Transplantation: Nomenclature, Surgical Techniques, Current Practice, and Long-term Outcome**

393

Guilherme Costa, Neha Parekh, Mohammed Osman, Sherif Armanyous, Masato Fujiki, and Kareem Abu-Elmagd

The successful development of multivisceral and composite visceral transplant is among the milestones in the recent history of human organ transplantation. All types of gastrointestinal transplants have evolved to be the standard of care for patients with gut failure and complex abdominal pathologic conditions. The outcome has markedly improved over the last 3 decades owing to technical innovation, novel immunosuppression, and better postoperative care. Recent data documented significant improvement in the long-term therapeutic indices of all types of visceral transplant close to that achieved with thoracic and solid abdominal organs.

**Pancreas Transplantation for Patients with Type 1 and Type 2 Diabetes Mellitus in the United States: A Registry Report**

417

Angelika C. Gruessner and Rainer W.G. Gruessner

Successful pancreas transplant is still the only method to restore short-term and long-term insulin independence and good metabolic control for patients with diabetes. Since the first transplant in 1966, tremendous progress in outcome was made; however, transplant numbers have declined since 2004. This article describes the development and risk factors of pancreas transplantation with or without a kidney graft between 2001 and 2016. Patient survival and graft function improved significantly owing to careful recipient and donor selection, which reduced technical failure and immunologic graft loss rates.

**Robotic Pancreas Transplantation**

443

Mario Spaggiari, Ivo G. Tzvetanov, Caterina Di Bella, and Jose Oberholzer

Obesity is considered a relative contraindication to pancreas transplant because of an overall increased risk in wound-related complications and surgical site infections. The rationale for performing pancreas transplant in a minimally invasive fashion is to reduce these risks, which can be associated with inferior patient and graft survival following pancreas transplant in morbidly obese patients. At the University of Illinois at Chicago, the initial series of robotic-assisted pancreas transplant in obese patients with type 1 and 2 diabetes has been performed. In this article, surgical technique and world experience in robotic pancreas transplant are described.