

Gebhard Wagener *Editor*

Liver Anesthesiology and Critical Care Medicine

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Gebhard Wagener, MD
Departments of Anesthesiology
College of Physicians & Surgeons
of Columbia University
New York, NY, USA

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*To Laurie, Ben, and Anna, who allow me to
enjoy life and work, and to my parents,
who contributed so much to what I am.*

Foreword

Liver transplantation has made remarkable progress in the 48 years since the first human liver transplant, and especially in the last 30 years since the introduction of cyclosporine made long-term survival after liver transplantation feasible.

A procedure that was initially untested and experimental became routine and is now the accepted treatment for end-stage liver disease in many parts of the world. About 6,000 liver transplants are done in the USA every year, and graft and patient survival is excellent. We are able to administer transplants to children, do living related and split liver transplants, and only the shortage of organs limits the expansion of our field.

This progress is not only due to advances in immunosuppression, surgical techniques or organ preservation, but also to improvements in anesthetic techniques. Anesthesia care initially provided by few experts in a small number of centers proliferated and is now often standardized and protocolized. Advances in anesthesiology enabled the development of surgical techniques such as caval cross-clamp or partial liver transplantation. There are few procedures in which the close cooperation of surgeon and anesthesiologist is as essential for the success of the surgery and liver (transplant) surgery would have never flourished as it did without the teamwork and partnership between anesthesiologists and surgeons.

Within the last 20 years there has been tremendous progress in clinical research of liver transplant anesthesia that aims to reduce blood transfusions, augment organ preservation, and improve overall outcome. Anesthesia for liver surgery has made a similar astounding progress and now extensive resections are conceivable that would have been impossible before. Postoperative critical care medicine as a continuation of the intraoperative care is now frequently in the hands of anesthesiologists and intensivists specialized in hepatic intensive care, reflecting the increasing knowledge in this field.

This book aims to summarize the progress in liver anesthesiology and critical care medicine of the last 20 years and serves as a guide to those who care for patients undergoing liver transplantation and liver resections. The authors are the leaders in the field of liver anesthesiology and critical care in Europe, Asia, and the United States. The foundation of this book is the

increasing fund of knowledge gained through clinical research as well as through the extensive clinical experience of the authors that they share with the readers.

This textbook provides the necessary background to understand the complexity of the liver and its pathophysiology. It summarizes the elaborate logistics involved in donor and recipient matching in Europe and the United States and then describes the routine intraoperative management of liver transplant recipients and patients undergoing hepatic resections. It addresses common comorbidities and complications and how they may affect the preoperative work-up and intraoperative management. The postoperative critical care section describes the routine care after liver transplantation and resection as well as diagnosis and management of possible complications including pain management.

This book aims to summarize our current knowledge of liver anesthesiology and critical care. It will serve as a reference for those who routinely care for patients with liver disease. Those new to our exciting field will gain sufficient knowledge to successfully address many of the complex issues that may arise during liver anesthesiology and critical care medicine. To those who have extensive experience in the care of patients undergoing liver (transplant) surgery this book will serve as an authoritative reference and enable an in-depth immersion into the exciting field of hepatic anesthesiology and critical care medicine.

Pittsburgh, PA, USA

Thomas E. Starz M.D., PH.D.

Preface

Liver transplantation and liver surgery have made enormous strides in the last 20 years. It has been transformed from an often heroic operation requiring massive amounts of blood transfusions to almost routine surgery with little blood loss in spite of increasing recipient morbidity. This advancement is reflected in improved long-term mortality rates in the face of preferentially allocating more marginal organs to sicker recipients.

Many little steps and advances are responsible for this achievement, not least improvements of anesthetic techniques and postoperative care. These little steps may not be immediately obvious but were necessary to accomplish such a progress. Clinical and preclinical research in liver anesthesiology and critical care medicine in the last 10 years has thrived, and a new generation of anesthesiologists and intensive care physicians are willing to scrutinize their clinical practice using clinical research tools instead of relying only on experience. This has created a fascinating and productive interaction within the small group of anesthesiologists and intensivists who care for these severely sick patients.

This book summarizes their current knowledge by bringing together the leading experts of our sub-specialty. It not only condenses a large amount of clinical research but also includes opinions and experiences when evidence is insufficient.

It is an in-depth review of the field and presents the current best knowledge. It aims to be the definitive resource of liver anesthesiology and critical care medicine. Experienced and busy practitioners will find essential information to manage complex conditions of liver disease. The novice anesthesiologist or resident will be able to use this book as a thorough and comprehensive introduction to our field and rapidly gain extensive knowledge as well as obtain practical advice for those complex and scary situations that can occur so frequently during liver transplantation.

This book provides a comprehensive review of the pathophysiology of liver disease, pharmacology, immunology, and its implications for the anesthesiologist and intensivist. Anesthesiologic and postoperative care of liver transplant recipients requires a thorough appreciation of the intricacies of liver disease and its complications. Extra-hepatic manifestations of liver disease are addressed in chapters separated by organ systems. Routine management as

well as common intra- and postoperative complications are described in detail to provide the knowledge required to care for these patients.

Liver transplantation is expanding internationally and a large body of work and experience originates from centers in Europe and Asia. Experts from the United States, Europe, and Asia have contributed to this book to give a global perspective of liver transplant anesthesiology.

A separate section reviews the anesthetic and postoperative management of patients undergoing liver resection. New surgical approaches have allowed us to perform more extensive and intricate resections that pose new challenges to the anesthesiologist and intensivists. Surgical techniques and their physiologic repercussions are described in detail and management strategies for routine as well as complex cases and their possible complications are offered.

We hope this book will alleviate the apprehension often associated with caring for these sick patients and encourage many readers to engage in liver anesthesiology and critical care medicine.

New York, NY, USA

Gebhard Wagener, M.D.

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I am sincerely grateful to my colleagues, residents, and nurses that I have had the pleasure to work with for many years now and to my patients, who taught me so much about disease, life, and death.

Contents

Part I Physiology, Pathophysiology and Pharmacology of Liver Disease

- 1 Physiology and Anatomy of the Liver** 3
Teresa A. Mulaikal and Jean C. Emond
- 2 Acute Hepatic Failure** 21
Andrew Slack, Navjoyt Ladher, and Julia Wendon
- 3 Drug Metabolism in Liver Failure** 43
Simon W. Lam
- 4 Evaluation of Liver Disease.** 51
D. Robert Dufour and Nazia Qazi

Part II Anesthesiology for Liver Transplantation

- 5 History of Liver Transplantation** 61
J.R. Klinck
- 6 Recipient and Donor Selection and Transplant
Logistics—The European Perspective** 67
Gabriela A. Berlakovich and Gerd R. Silberhumer
- 7 Recipient and Donor Selection and Transplant Logistics:
The US Perspective** 73
Ingo Klein and Claus U. Niemann
- 8 Surgical Techniques in Liver Transplantation** 83
Abdulelah M. Alhawsawi and Juan del Rio Martin
- 9 Intraoperative Monitoring** 97
Claus-Georg Krenn
- 10 Practice Patterns of Liver Transplant Anesthesiology** 111
Ann Walia and Roman Schumann

11 Caval Cross-Clamping, Piggyback, and Veno-Venous Bypass	131
Ruairi Moulding and Paul Picton	
12 Liver Transplantation: Hemodynamic Changes, Cardiac Output Monitoring and Inotropic Support	139
Anand D. Padmakumar and Mark C. Bellamy	
13 Coagulopathy: Pathophysiology, Evaluation, and Treatment	147
Matthew R. Kappus and Arun J. Sanyal	
14 Physiology, Prevention, and Treatment of Blood Loss During Liver Transplantation	169
Freeha Arshad, Ton Lisman, and Robert J. Porte	
15 The Marginal Liver Donor and Organ Preservation Strategies	181
Coney Bae, Scot D. Henry, Giridhar Vedula, and James V. Guarrera	
16 Pediatric Liver Transplantation	195
Philipp J. Houck	
17 Combined Solid Organ Transplantation Involving the Liver	205
Geraldine Diaz	
18 Liver Transplantation for the Patient with High MELD	215
Cynthia Wang and Randolph Steadman	
19 Perioperative Considerations for Transplantation in Acute Liver Failure	223
Christopher P. Snowden and David M. Cressey	
20 Renal Failure	233
Lloyd Meeks and Joseph Meltzer	
21 The Patient with Severe Comorbidities: Cardiac Disease	243
Shahriar Shayan and Andre M. De Wolf	
22 Pulmonary Complications of Liver Disease	255
Mercedes Susan Mandell and Masahiko Taniguchi	
23 Liver Transplantation: The Patient with Severe Co-morbidities, CNS Disease and Increased Intracranial Pressure	267
Chris Willars and Georg Auzinger	