Carol E. H. Scott-Conner • Andreas M. Kaiser
Ninh T. Nguyen • Umut Sarpel • Sonia L. Sugg
Editors

Chassin's Operative Strategy in General Surgery

An Expositive Atlas

Fifth Edition

Springer

Editors
Carol E. H. Scott-Conner
Department of Surgery
University of Iowa Carver College of Medicine
Iowa City, IA, USA

Ninh T. Nguyen
Department of Surgery
University of California, Irvine
Orange, CA, USA

Sonia L. Sugg
Department of Surgery
University of Iowa Carver College of Medicine
Iowa City, IA, USA

Andreas M. Kaiser
Department of Surgery
Division of Colorectal Surgery
City of Hope National Medical Center/
Comprehensive Cancer Center
Duarte, CA, USA

Umut Sarpel
Division of Surgical Oncology
Icahn School of Medicine at Mount Sinai
New York, NY, USA

ISBN 978-3-030-81414-4 ISBN 978-3-030-81415-1 (eBook)
https://doi.org/10.1007/978-3-030-81415-1

© Springer Nature Switzerland AG 2014, 2022
This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

For surgery residents everywhere
Umut Sarpel

Foreword to the Third Edition

Eight years have passed since the publication of the second edition of this atlas. During that period, I retired from the practice of surgery and from the chairmanship of the Department of Surgery at the New York Hospital Medical Center of Queens, concluding an exciting and stimulating run of 34 years, the highlight of which was teaching several generations of residents the intellectual and technical details of surgery. A vital component of this program was the atlas *Operative Strategy in General Surgery*, the first edition of which was published in 1980. The success of this work was due in large part to the fact that it was based on my day-to-day learning and teaching in the operating room. Having retired from the operating room, I felt that I could not produce a quality, up-to-date product for the third edition of this work. Fortunately, we were able to recruit an outstanding surgeon-teacher to edit the third edition.

Dr. Carol Scott-Conner, whom I taught when she was a resident in 1980, has the intellect, teaching skills, and drive to have functioned as an author, surgeon, teacher, and Head of the Department of Surgery at the University of Iowa. In editing this volume, she has reviewed each chapter to make sure that the text and references are up to date. Although the previous editions were the work of a single author (me), it is a fact that surgery and medical science have advanced so rapidly that it is no longer feasible for a single author to write a comprehensive surgical text like this one. Consequently, 13 prominent surgeons have each contributed a chapter that reviews and analyzes recent advances in the fields of the contributor's special expertise. Eight new operations have been added, most of which are laparoscopic procedures. In addition, 77 operations from my last edition, having proven themselves worthy by the test of time, are included in this volume, together with the meticulous operating room illustrations by Caspar Henselmann. Many of these procedures are complex, such as esophagectomy, total colectomy with ileoanal pouch, and pancreatoduodenectomy. Special attention has been paid to emphasize in the drawings the detailed teaching points that will make these operations safe for the patient.

I hope that our combined efforts have produced an atlas that you will find useful.

New York, NY, USA — Jameson L. Chassin, MD

Preface to the Fifth Edition

The year was 1979. I was a fourth-year surgical resident at New York University, sent for a 2-month rotation to the (then) Booth Memorial Medical Center. Many university programs have a similar rotation: residents are sent to an outlying affiliated hospital for a couple of months of intensive bread-and-butter surgery and an experience of what life is like in the real world of private practice. Jim Chassin, his associates Jim Turner and Kenny Rifkind, and the Booth Memorial residents welcomed me and shared their busy surgical practice with me. My notes from the time indicate I scrubbed on a wide variety of cases, many with Jim Chassin. The procedures were the very operations described in this text, and I hear his voice coaching me as I read his words.

Surgical staplers were just coming into common use that year. My university program had not yet adopted these devices, reasoning that residents need to learn how to suture before using staplers. Thus, it was from Jim Chassin that I learned how to do a low anterior resection with a circular stapled anastomosis. He reinforced his instructions with copies of the typed manuscripts of the relevant chapters from a book he was writing, complete with rough sketches by his artist. When the first volume of the first edition of Chassin's *Operative Strategy in General Surgery* came out, I bought it and literally wore out my copy. The second volume followed in due course, and eventually a second edition. I recommended the book to untold numbers of residents.

It was thus with a sense of the circle coming around to full closure that I undertook the editorship of the third edition upon Dr. Chassin's retirement from that role. Searching through my files, I found original manuscript copies with my handwritten notes from that 1979 rotation.

Eighteen years have now passed since that third edition was published. A fourth edition followed, and now I am proud to release the fifth edition.

This fifth edition is a major revision that strives to remain faithful to the purpose and tone of Dr. Chassin's original text. Four section editors—Andreas M. Kaiser, MD; Ninh T. Nguyen, MD; Umut Sarpel, MD; and Sonia Sugg, MD—have brought specialized expertise to appropriate parts. All of the art is new, created specifically for this edition. Color is used throughout, and color photographs have been added.

The purpose of this volume remains, as it was so eloquently stated by Frank C. Spencer, MD, in the foreword to the first edition, to serve "all clinical surgeons, both those in training and those in surgical practice" by "specifically discussing the conceptual basis of the operation as well as the strategy that will help the surgeon avoid common pitfalls … the operative technique is then described step by step."

As an academic surgeon, I am struck by how frequently a resident will comment "I've never even seen one of these" when we embark upon certain formerly common operations, such as an open common bile duct exploration. For this new generation of surgeons, I've included most of the procedures that were in previous editions. Those that are rarely used are labeled *Surgical Legacy Technique*, for that is what this book is—the legacy of a master surgeon: an extraordinary surgeon and a kind and gentle man I have been privileged to scrub with and to have as a friend. I hope that you will still hear his voice speaking through these pages.

This work could not have been completed without the wise counsel of Richard Hruska, my editor; the skilled assistance of Margaret Burns, developmental editor; and the loving support of my husband, Dr. Harry Conner. My patients, students, residents, and coworkers continue to teach and inspire me.

Iowa City, IA, USA Carol E. H. Scott-Conner, MD, PhD

Contents

Part I General Principles
Andreas M. Kaiser

1 Concepts and Strategies of Surgery . . . 3
Andreas M. Kaiser and Carol E. H. Scott-Conner
Developing a Concept . . . 3
Establishing Strategy . . . 4
Making the Operation Easy . . . 4
Further Reading . . . 5

2 Mechanical Basics of Operative Technique . . . 7
Constantine P. Spanos and Carol E. H. Scott-Conner
Introduction . . . 7
Before You Scrub . . . 7
Preoperative Verification Process . . . 8
Importance of Surgeon's Foot and Body Position . . . 8
Use of Instruments . . . 11
Scalpel . . . 11
Metzenbaum Scissors . . . 12
Electrocautery as a Cutting Device . . . 12
Forceps . . . 12
Needle Holder . . . 12
Hemostat . . . 13
Further Reading . . . 13

3 Incision, Exposure, Closure . . . 15
Constantine P. Spanos, Andreas M. Kaiser, and Carol E. H. Scott-Conner
Achieving Exposure . . . 15
Incisions for Abdominal Surgery . . . 16
Avoiding Wound Dehiscence and Hernia . . . 17
Operative Technique for a Midline Incision . . . 18
Making the Incision . . . 18
Open Surgery . . . 18
Port Insertion During Laparoscopic Surgery . . . 19
Closure of Midline Incision . . . 20
Modified Smead-Jones Technique . . . 20
Standard Running Closure . . . 20
Interrupted Closure . . . 20
Skin Closure . . . 20
Further Reading . . . 21

4 Dissecting and Suturing 23
Constantine P. Spanos, Andreas M. Kaiser, and Carol E. H. Scott-Conner
Art of Dissecting Planes 23
Sewing Technique 24
Use of a Needle Holder 24
Selection of Needle 24
Size of Bite 24
Distance Between Sutures 25
Size of Suture Material 25
Continuous Versus Interrupted Sutures 25
How Tight the Knot? 25
Catching Both Walls of Intestine with One Pass of the Needle Holder 25
Types of Stitches 26
Simple Everting Skin Stitch 26
Vertical Mattress (Stewart) Stitch 26
Continuous Subcuticular Stitch 27
Skin Staples 27
Simple Interrupted Fascial Stitch 27
Continuous Simple Over-and-Over Stitch 28
Smead-Jones Stitch 28
Horizontal Mattress Stitch 28
Hemostatic Figure-of-Eight Stitch 29
Single-Layer Bowel Anastomosis 29
Seromuscular Lembert Stitch 29
Cushing Stitch 29
Halsted Stitch 30
Continuous Locked Stitch 30
Connell Stitch 30
Technique of Successive Bisection 31
Intestinal Anastomoses 31
One Layer or Two? 31
End-to-End or End-to-Side Technique? 31
Sutured or Stapled Anastomosis? 32
Suture Material 32
Absorbable Sutures 32
Plain Catgut 32
Chromic Catgut 32
Polyglycolic Synthetics 32
Nonabsorbable Sutures 33
Natural Nonabsorbable Sutures 33
Synthetic Nonabsorbable Braided Sutures 33
Synthetic Nonabsorbable Monofilaments 33
Monofilament Stainless Steel Wire 33
Knot-Tying Technique 33
Further Reading 35

5 Surgical Stapling: Principles and Precautions 37
Erik R. Noren and Sang W. Lee
Characteristics of Staples 37
Surgical Stapling Technology 37
Linear Stapling Device 37
Linear Cutting Stapling Device 37
Circular Stapling Device 39

Tissue Properties of the Stapled Anastomosis . . . 39
Causes of Failure Following Stapled Anastomosis . . . 40
Ischemia . . . 40
Tension . . . 40
Tissue Quality . . . 40
Instrument Failure . . . 40
Technical Error . . . 40
Microbiology . . . 41
Patient Factors . . . 41
Stapled vs. Hand-Sewn Anastomosis . . . 41
Reducing Anastomotic Complications in Practice . . . 41
Hemostasis . . . 41
Intraoperative Leak Testing . . . 42
Perfusion Testing . . . 42
Summary . . . 42
Further Reading . . . 42

6 Control of Bleeding . . . 43
Morgan Schellenberg and Kenji Inaba
General Principles of Resuscitation . . . 43
Control of Hemorrhage . . . 43
Thoracic Hemorrhage . . . 43
Upper Mediastinum and Pulmonary Hilum . . . 43
Lung Parenchymal Injuries . . . 44
Abdominal Hemorrhage . . . 44
Abdominal Aorta, IVC, and Their Branches . . . 44
Zones of the Retroperitoneum . . . 44
Medial Visceral Rotations . . . 45
Solid Abdominal Viscera . . . 45
Spleen and Kidney . . . 45
Liver . . . 45
Pelvic Hemorrhage . . . 46
Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) . . . 46
Extremity and Junctional Hemorrhage . . . 47
Techniques to Achieve Hemostasis . . . 47
Hemostat and Ligature . . . 47
Tying in Continuity . . . 47
Suture Ligation . . . 47
Clips . . . 47
Staplers . . . 48
Electrocautery . . . 49
Ultrasonic Shears . . . 50
Further Reading . . . 50

7 Management of the Contaminated Operation . . . 51
Rahila Essani, Donald C. LaSeur, and Andreas M. Kaiser
The Challenge . . . 51
Preoperative Considerations . . . 52
Timing of Surgery . . . 52
Resuscitation Before Surgery . . . 52
Antibiotic Management . . . 52
Preoperative Imaging . . . 52
Intraoperative Considerations . . . 53
Supportive Measures and Fluid Management . . . 53

Importance of Surgical Skills and Technique . . . 53
Source Control . . . 53
Containing the Contamination . . . 54
Wound Irrigation . . . 54
Other Considerations . . . 54
Postoperative Considerations . . . 55
Wound Closure . . . 55
Wound Care . . . 55
Further Reading . . . 55

8 Damage Control Laparotomy . . . 57
James M. Bardes and Kenji Inaba
Indications . . . 57
Damage Control Strategy and Decision-Making . . . 57
Damage Control Laparotomy in Trauma . . . 57
Damage Control Management of Selected Injuries . . . 58
Damage Control in Nontrauma . . . 60
Temporary Closure of the Open Abdomen . . . 60
Postoperative Management and Return to the Operating Room . . . 61
Further Reading . . . 62

9 Mechanical Basics of Laparoscopic Surgery . . . 63
Sarah M. Popek and Zoë O. Jones
Ergonomics and Operating Room Design . . . 63
Equipment . . . 63
Setup and Trouble Shooting . . . 65
Access to Abdomen . . . 65
Laparoscopic Hemostasis and Energy Sources . . . 67
Hemostatic Products and Adjuncts . . . 67
Tissue Approximation . . . 68
Pitfalls and Danger Points . . . 70
Access Injuries . . . 70
Hypotension . . . 71
Hemorrhage . . . 72
Hypoxia . . . 72
Postoperative Bowel Obstruction . . . 72
Laparoscopy in Pregnancy . . . 73
Preoperative Considerations . . . 73
Intraoperative Considerations . . . 73
Laparoscopy in Previous Abdominal Surgery . . . 73
Further Reading . . . 74

10 Rational Use of Drains . . . 77
Kulmeet K. Sandhu
Purpose of Drains . . . 77
Various Drains and Their Pros and Cons . . . 77
Penrose Drain . . . 77
Polyethylene or Rubber Tube Drain . . . 77
Silicone Tube Drain . . . 78
Sump Suction Drains . . . 78
Closed Suction Drain . . . 78
Gauze Packing . . . 78
Prevention of Drainage Tract Infection . . . 78
Management of Intraperitoneal Sepsis . . . 79

Percutaneous Drainage of Abdominal Abscesses with Computed Tomography or Ultrasound Guidance . . . 79
Negative Pressure Wound Therapy (NPWT) . . . 79
Other Indications and Methods of Drainage . . . 79
Abscess . . . 79
Blood and Serum . . . 79
Bile . . . 80
Pancreatic Secretions . . . 80
Anastomosis . . . 80
Further Reading . . . 80

11 Illustrated Glossary of Surgical Instruments . . . 81
Erik R. Noren and Andreas M. Kaiser
Introduction . . . 81

12 Surgical Documentation, Informed Consent, and Operative Note . . . 89
Andreas M. Kaiser
Defining Value of Documentation . . . 89
Elements of Surgical Documentation . . . 89
Provider Chart Entry . . . 89
Informed Written Consent . . . 89
Operative Note . . . 90
Operative Note . . . 90
Teaching Documentation . . . 91
References . . . 91

Part II Esophagus
Ninh T. Nguyen

13 Concepts in Esophageal Surgery . . . 95
Olugbenga T. Okusanya and James D. Luketich
Gastroesophageal Reflux Disease and Type I Paraesophageal Hernia . . . 95
Anti-reflux Operations . . . 96
Wrap Choice . . . 97
Alternatives to Traditional Surgery . . . 97
Paraesophageal Hiatus Hernia . . . 98
Achalasia . . . 99
Esophageal Perforation . . . 101
Esophageal Diverticulum . . . 102
Cricopharyngeal Diverticulum . . . 103
Epiphrenic Diverticulum . . . 104
Barrett's Esophagus . . . 105
Workup of Esophageal Cancer . . . 105
Esophagectomy . . . 106
Choice of Esophagectomy Technique . . . 107
Anastomotic Leakage . . . 108
References . . . 109

14 Laparoscopic and Thoracoscopic Ivor Lewis Esophagectomy . . . 115
Simon R. Turner, Daniela Molena, and Virginia R. Litle
Indications . . . 115
Preoperative Preparation . . . 115
Pitfalls and Danger Points . . . 116
Abdominal Phase . . . 116
Thoracic Phase . . . 116

Documentation . . . 116
Operative Strategy . . . 116
Abdominal Tumor Dissection, Lymphadenectomy, and Mobilization of the Gastric Conduit . . . 116
Abdominal Adjunct Procedures . . . 116
Thoracic Resection . . . 116
Thoracic Anastomosis . . . 117
Operative Technique . . . 117
Position and Incisions for the Abdominal Phase . . . 117
Laparoscopic Lymphadenectomy and Gastric Mobilization . . . 117
Pyloric Drainage and Feeding Jejunostomy . . . 118
Transhiatal Dissection and Creation of the Gastric Conduit . . . 119
Positioning for the Thoracic Phase . . . 119
Thoracoscopic Dissection . . . 120
Esophagogastric Anastomosis . . . 120
Postoperative Care . . . 122
Complications . . . 122
Anastomotic Leak . . . 122
Tracheoesophageal Fistula (TEF) . . . 122
Conduit Necrosis . . . 123
Chylothorax . . . 123
Paraconduit Herniation . . . 123
Cardiopulmonary Complications . . . 123
Avoiding Postoperative Complications . . . 123
Anastomotic Leak and Stricture . . . 123
Tracheoesophageal Fistula (TEF) . . . 124
Thoracic Duct Injury . . . 124
Paraconduit Herniation . . . 124
Pyloric Complications . . . 124
Further Reading . . . 124

15 Transhiatal Esophagectomy . . . 127
Arjun Pennathur, Peter F. Ferson, and Rodney Landreneau
Introduction . . . 127
Preoperative Preparation . . . 127
Patient Selection . . . 127
Indications . . . 127
Preoperative Preparation . . . 127
Pitfalls and Danger Points . . . 128
Contraindications . . . 128
Pitfalls . . . 128
Documentation . . . 129
Operative Strategy . . . 129
Avoiding Postoperative Complications . . . 129
Operative Technique . . . 129
Patient Preparation and Initial Steps . . . 129
Abdominal Phase: Laparoscopy/Laparotomy . . . 130
Cervical Phase . . . 131
Transhiatal Mediastinal Dissection . . . 131
Preparation of the Gastric Conduit and Transposition to the Neck . . . 132
Cervical Esophagogastric Anastomosis . . . 134
Handsewn Anastomosis . . . 134
Construction of Anastomosis with an EEA Stapler . . . 134

Total Mechanical Stapling with Modified Collard Technique . . . 135
Hybrid Stapling Approach . . . 135
Postoperative Care . . . 136
Complications . . . 137
Hemorrhage . . . 137
Tracheal Tear . . . 137
Pleural Complications . . . 137
Chylothorax . . . 137
Nerve Injury . . . 137
Anastomotic Leaks . . . 138
Splenectomy . . . 138
Further Reading . . . 138

16 Laparoscopic Heller Myotomy for Achalasia . . . 141
Jeffrey E. Quigley and Keith R. Scharf
Preoperative Preparation . . . 141
Workup . . . 141
Preoperative Nutrition and Optimization . . . 141
Pitfalls and Dangers . . . 141
Pseudoachalasia . . . 141
Incomplete Myotomy . . . 141
Bleeding . . . 141
Esophageal Perforation . . . 141
Vagal Injury . . . 142
Gastroesophageal Reflux . . . 142
Documentation . . . 142
Operative Strategy . . . 142
Division of the Short Gastric Vessels and Mobilization of the Fundus . . . 142
Mobilization of the Esophagus and Removal of the Esophageal Fat Pad . . . 142
Esophageal Myotomy Down to the Submucosal Layer Carried Down onto the Gastric Cardia . . . 142
Anti-reflux Procedure . . . 142
Avoiding Postoperative Complications . . . 143
Operative Technique . . . 143
Postoperative Care . . . 145
Complications . . . 145
Further Reading . . . 145

17 Endoscopic Stent for Management of Esophageal Leaks . . . 147
Eugene Kahn and Shaun Daly
Indications . . . 147
Preoperative Assessment . . . 147
Pitfalls and Danger Points . . . 147
Operative Strategy . . . 147
Length and Diameter . . . 148
Shape . . . 148
Material . . . 148
Coating . . . 148
Positioning . . . 148
Antibiotics . . . 148
Documentation Basics . . . 149
Operative Technique . . . 149
Postoperative Care . . . 150
Complications . . . 150
Further Reading . . . 150

18 Laparoscopic Nissen Fundoplication for Gastroesophageal Reflux Disease 151
Michael N. Tran and Marcelo W. Hinojosa
Indications 151
Preoperative Preparation 151
Pitfalls and Danger Points 151
Documentation 151
Operative Strategy 151
Avoiding Postoperative Complications 151
Operative Technique 152
Room Setup, Trocar Placement, and Exposure of the Hiatus 152
Dissecting the Hiatus 153
Mobilizing the Esophagus 155
Closure of the Hiatus 155
Construction of the Fundoplication 155
Postoperative Care 157
Complications 157
Further Reading 157

19 Laparoscopic Magnetic Augmentation of the Lower Esophageal Sphincter . . . 159
James M. Tatum and John C. Lipham
Preoperative Preparation 159
Pitfalls and Danger Points 159
Operative Strategy 159
Documentation Basics 159
Operative Technique 160
Room Setup and Trocar Placement 160
Exposure of the Hiatus 160
Dissecting the Hiatus 160
Closure of the Hiatus 161
Identification and Dissection of the Posterior Nerve 161
Sizing of the LINX Device 161
Placing and Securing the Linx Device 162
Closure 162
Postoperative Care 162
Postoperative Complications 162
Further Reading 162

20 Laparoscopic Paraesophageal Hernia Repair 165
Nabeel R. Obeid and Aurora D. Pryor
Preoperative Preparation 165
Pitfalls and Danger Points 165
Documentation 166
Operative Strategy 166
Reduction/Dissection 166
Diaphragmatic Repair 167
Reconstruction 167
Avoiding Postoperative Complications 167
Operative Technique 167
Postoperative Care 169
Complications 169
Short-Term Complications 170
Bleeding 170
Abscesses 170

Pneumothorax . . . 170
Cardiac Arrhythmias . . . 170
Long-Term Complications . . . 170
Dysphagia . . . 170
Recurrence . . . 170
Gastroparesis . . . 170
Further Reading . . . 170

21 Laparoscopic Collis Gastroplasty . . . 173
Mohan K. Mallipeddi and Miguel A. Burch
Indications . . . 173
Preoperative Preparation . . . 173
Pitfalls and Danger Points . . . 173
Documentation . . . 173
Operative Strategy . . . 174
Operative Technique . . . 174
Postoperative Care . . . 175
Complications . . . 176
Further Reading . . . 176

22 Endoscopic Antireflux Procedures . . . 177
Jason Samarasena, David Lee, and Kenneth Chang
Indications . . . 177
Preoperative Preparation . . . 177
Pitfalls and Danger Points . . . 177
Operative Strategy . . . 177
Nonablative Radiofrequency Therapy (Stretta) . . . 177
Transoral Incisionless Fundoplication (TIF) . . . 178
Documentation . . . 178
Operative Technique . . . 178
Nonablative Radiofrequency Therapy (Stretta) . . . 178
Transoral Incisionless Fundoplication (TIF) . . . 180
Complications . . . 181
Nonablative Radiofrequency Therapy (Stretta) . . . 181
Postoperative Care . . . 182
Transoral Incisionless Fundoplication (TIF) . . . 182
Further Reading . . . 182

23 Peroral Endoscopic Myotomy for Achalasia . . . 183
Paul D. Colavita and Kevin M. Reavis
Preoperative Preparation . . . 183
Pitfalls and Danger Points . . . 183
Documentation . . . 184
Operative Strategy . . . 184
Avoiding Postoperative Complications . . . 184
Mucosal Injuries and Tears of the Mucosotomy . . . 184
Operative Technique . . . 185
Endoscopic Measurements . . . 185
Submucosal Tunnel . . . 185
Circular Myotomy . . . 186
Mucosotomy Closure . . . 186
Postoperative Care . . . 186
Complications . . . 186
Gastroesophageal Reflux Disease (GERD) . . . 187
Further Reading . . . 187

Part III Stomach and Duodenum
Ninh T. Nguyen and Umut Sarpel

24 Concepts in Surgery of the Stomach and Duodenum 191
Sean P. Harbison and Daniel T. Dempsey
Operation for Morbid Obesity 191
Operation for Gastric Cancer 192
Subtotal Versus Total Gastrectomy 192
Extent of Lymphadenectomy 193
EUS and Diagnostic Laparoscopy 193
Laparoscopic Gastrectomy 193
Gastrointestinal Stromal Tumors (GISTs) 193
Surgery for Peptic Ulcer 194
Operation for Perforated Peptic Ulcer 194
The Role of Vagotomy in Peptic Ulcer Surgery 195
The Choice of Drainage Operation 196
The Role of Resection in Peptic Ulcer Surgery 196
Reconstruction after Distal Gastrectomy 196
Billroth I Versus Billroth II 196
Billroth II Versus Roux-En-Y 196
Other Reconstruction Options 197
Operation for Obstructing Peptic Ulcer 197
Operation for Bleeding Peptic Ulcer 197
Operation for Nonhealing Peptic Ulcer 197
Operation for Postoperative Recurrent Ulcer or Marginal Ulcer 198
Gastrostomy and Duodenostomy 199
Gastrostomy 199
Duodenostomy 199
Stapling the Stomach and Duodenum 199
Postoperative Complications 200
Pulmonary Problems 200
Anastomotic Leak 200
Wound Problems 200
Pancreatitis 201
Early Gastric Stasis 201
Dumping Syndrome 201
Diarrhea 201
Bile Reflux Gastritis 202
Chronic Gastric Stasis and Roux Syndrome 202
Metabolic Problems after Gastric Operation 203
References 203

25 Truncal Vagotomy: Surgical Legacy Technique 207
Carol E. H. Scott-Conner
Indications 207
Preoperative Preparation 207
Pitfalls and Danger Points 207
Operative Strategy 207
Avoiding Esophageal Trauma 207
Avoiding Splenic Trauma 207
Preventing Incomplete Vagotomy 207
Hiatus Hernia 209
Documentation Basics 209

Operative Technique . . . 209
Incision and Exposure . . . 209
Left (Anterior) Vagal Trunks . . . 209
Identification of the Right (Posterior) Vagus . . . 209
Suture of Crural Musculature . . . 210
Postoperative Care . . . 210
Complications . . . 210
Further Reading . . . 210

26 Proximal Gastric Vagotomy: Surgical Legacy Technique . . . 211
Carol E. H. Scott-Conner
Indications . . . 211
Preoperative Preparation . . . 211
Pitfalls and Danger Points . . . 211
Operative Strategy . . . 211
Exposure . . . 211
Prevention of Hematoma and Injury to Gastric Lesser Curve . . . 211
Preserving Innervation of the Antrum . . . 211
Adequacy of Proximal Vagotomy . . . 211
Postoperative Gastroesophageal Reflux . . . 212
Documentation Basics . . . 212
Operative Technique . . . 212
Incision and Exposure . . . 212
Identification of Right and Left Vagal Trunks . . . 212
Identification of Crow's Foot . . . 212
Dissection of the Anterior Nerve of Latarjet . . . 213
Dissection of Posterior Nerve of Latarjet . . . 214
Repair of the Lesser Curvature . . . 214
Postoperative Care . . . 214
Complications . . . 215
Further Reading . . . 215

27 Pyloroplasty (Heineke-Mikulicz and Finney), Operation for Bleeding Duodenal Ulcer: Surgical Legacy Technique . . . 217
Carol E. H. Scott-Conner
Indications . . . 217
Preoperative Preparation . . . 217
Pitfalls and Danger Points . . . 217
Operative Strategy . . . 217
Control of Bleeding . . . 217
Choice of Pyloroplasty . . . 217
Documentation Basics . . . 218
Operative Technique . . . 218
Kocher Maneuver . . . 218
Pyloroduodenal Incision for Heineke-Mikulicz Pyloroplasty . . . 218
Emergency Procedure for Bleeding Ulcer . . . 218
Heineke-Mikulicz Pyloroplasty . . . 219
Stapling . . . 219
Finney Pyloroplasty . . . 221
Postoperative Care . . . 221
Complications . . . 222
Reversal of Pyloroplasty or Gastrojejunostomy . . . 222
Further Reading . . . 222

28 Gastrojejunostomy . . . 223
Malini D. Sur
Indications . . . 223
Preoperative Preparation . . . 223
Pitfalls and Danger Points . . . 223
Operative Strategy . . . 223
Documentation Basics . . . 224
Operative Technique: Open . . . 224
Incision . . . 224
Freeing the Greater Curvature . . . 224
Preparing the Jejunal Limb . . . 224
Open Handsewn Technique . . . 224
Open Stapled Technique . . . 225
Operative Technique: Laparoscopic . . . 226
Access . . . 226
Preparation of the Jejunal Limb . . . 226
Gastrojejunal Anastomosis: Laparoscopic Stapled Technique . . . 226
Postoperative Care . . . 226
Complications . . . 226
Further Reading . . . 227

29 Partial Gastrectomy . . . 229
Ashley E. Russo, Carol E. H. Scott-Conner, and Vivian E. Strong
Indications . . . 229
Preoperative Preparation . . . 229
Pitfalls and Danger Points . . . 229
Operative Strategy . . . 229
Type of Resection . . . 229
Choice of Reconstruction . . . 230
Duodenal Stump Leak . . . 230
Splenic Trauma . . . 230
Documentation Basics . . . 230
Operative Technique . . . 230
Gastric Wedge Resection . . . 230
Indications . . . 230
Minimally Invasive Wedge Resection . . . 230
Equipment . . . 230
Laparoscopic Setup and Positioning . . . 231
Operative Steps . . . 231
Entry and Port Placement . . . 231
Tumor Localization and Entry into Lesser Sac . . . 231
Tumor Mobilization and Resection, Specimen Extraction, and Closure . . . 231
Robotic Gastric Wedge Resection . . . 231
Open Wedge Resection . . . 234
Intragastric Resection . . . 234
Distal Gastrectomy with Billroth I or II Reconstruction . . . 234
Open Distal Gastrectomy . . . 234
Incision and Exposure . . . 234
Division of Left Gastric Vessels . . . 235
Division of Stomach . . . 236
Duodenal Dissection . . . 236
Division of Duodenum . . . 236
Billroth I Gastroduodenal Anastomosis . . . 236
Billroth II: Closure of Duodenal Stump . . . 239
Duodenal Closure with Surgical Staples . . . 239

Billroth II Gastrojejunal Anastomosis, Handsewn . . . 240
Billroth II Gastrojejunal Anastomosis, Stapled . . . 241
Drainage and Closure . . . 245
Postoperative Care . . . 245
Complications . . . 245
Duodenal Fistula . . . 245
Gastric Outlet Obstruction . . . 245
Afferent Loop Obstruction and Afferent Loop Syndrome . . . 245
Dumping Syndrome . . . 245
Marginal Ulcer . . . 245
Further Reading . . . 246

30 Perforated Duodenal Ulcer . . . 247
Sharmila Dissanaike and Carol E. H. Scott-Conner
Indications . . . 247
Perforated Duodenal Ulcer . . . 247
Preoperative Preparation . . . 247
Pitfalls and Danger Points . . . 247
Operative Strategy . . . 247
Documentation Basics . . . 247
Operative Technique . . . 248
Incision . . . 248
Identification of Perforation . . . 248
Patch Repair of Perforation . . . 248
Abdominal Closure . . . 248
Postoperative Care . . . 249
Complications . . . 249
Further Reading . . . 249

31 Laparoscopic Plication of Perforated Duodenal Ulcer . . . 251
Edwin Onkendi
Indications . . . 251
Preoperative Preparation . . . 251
Potential Pitfalls and Dangers Points . . . 251
Documentation Tips . . . 251
Operative Strategy . . . 251
Operative Technique . . . 252
Securing the Omental Patch . . . 253
Omental Onlay Patch after Primary Closure . . . 253
Omental Plug Technique . . . 253
Omental Radial Patch Technique . . . 253
Testing the Integrity and Security of the Perfortion Repair . . . 253
Postoperative Care . . . 253
Role of EGD . . . 254
Complications . . . 254
Further Reading . . . 254

32 Enteral Access . . . 255
Mariela Rivera and Henry Schiller
Indications . . . 255
Percutaneous Gastrostomy . . . 255
Surgical Gastrostomy . . . 255
Jejunostomy . . . 255
Pitfalls and Danger Points . . . 255
Operative Strategy . . . 255

Operative Technique . . . 256
Percutaneous Endoscopic Gastrostomy (PEG) Tube Placement . . . 256
Stamm Gastrostomy . . . 257
Witzel Jejunostomy . . . 259
Further Reading . . . 260

33 Distal Gastrectomy with D2 Nodal Dissection . . . 261
Hisakazu Hoshi
Indications . . . 261
Preoperative Preparation . . . 261
Pitfalls and Danger Points . . . 261
Documentation Basics . . . 261
Operative Strategy . . . 261
Extent of Resection . . . 261
Pancreatico-Splenectomy, Splenectomy . . . 263
Blood Supply to Residual Gastric Pouch . . . 263
Duct of Santorini . . . 265
Operative Technique . . . 265
Incision and Exposure . . . 265
Resection . . . 265
Omentectomy and Infrapyloric Nodal Dissection . . . 265
Dissection of Suprapyloric Nodes . . . 265
Division of the Duodenum . . . 266
Hepatic Artery Node Dissection . . . 266
Celiac Axis Dissection and Division of Left Gastric Vessels . . . 266
Postoperative Care . . . 268
Complications . . . 268
Further Reading . . . 268

34 Total Gastrectomy . . . 269
Hisakazu Hoshi
Indications . . . 269
Preoperative Preparation . . . 269
Pitfalls and Danger Points . . . 269
Documentation Basics . . . 269
Operative Strategy . . . 269
Exposure . . . 269
Esophageal Anastomosis . . . 269
Prevention of Reflux Alkaline Esophagitis . . . 270
Extent of the Operation . . . 270
Operative Technique . . . 270
Incision and Exposure . . . 270
Exploration and Determination of Operability . . . 270
Omentectomy, Lymph Node Dissection, and Division of Duodenum . . . 271
Splenectomy . . . 271
Splenic Nodal Dissection without Splenectomy . . . 271
Dissection of the Esophagocardiac Junction: Vagotomy . . . 271
Preparation of the Roux-En-Y Jejunal Segment . . . 272
End-to-Side Sutured Esophagojejunostomy . . . 272
End-to-Side Stapled Esophagojejunostomy . . . 273
Roux-En-Y Jejunojejunostomy . . . 274
Sutured Version . . . 274
Stapled Version . . . 276
Modifications of Operative Technique for Patients with Benign Disease . . . 276

Wound Closure . . . 277
Postoperative Care . . . 277
Complications . . . 277
Further Reading . . . 277

35 Management of Gastrointestinal Stromal Tumor of the Stomach . . . 279
Eugene J. Won and Brian R. Smith
Introduction . . . 279
Preoperative Preparation . . . 279
Pitfalls and Danger Points . . . 279
Operative Strategy and Management . . . 279
Documentation . . . 281
Operative Strategy and Technique . . . 281
Laparoscopic Wedge Resection . . . 281
Postoperative Care . . . 282
Complications . . . 282
References . . . 282

36 Exposure of the Third and Fourth Portions of the Duodenum . . . 283
Natasha Leigh and Benjamin Golas
Indications . . . 283
Preoperative Preparation . . . 283
Pitfalls and Danger Points . . . 283
Operative Strategy . . . 283
Documentation Basics . . . 283
Operative Technique . . . 284
Incision . . . 284
Liberation of Right Colon . . . 284
Liberation of Small Bowel Mesentery . . . 284
Intraoperative Endoscopy . . . 284
Resection of Duodenum . . . 284
Closure . . . 285
Minimally Invasive Approach . . . 285
Postoperative Care . . . 286
Complications . . . 286
Further Reading . . . 286

37 Laparoscopic Sleeve Gastrectomy . . . 287
John Morton and Jamie Dutton
Indications . . . 287
Contraindications . . . 287
Relative Contraindications . . . 287
Preoperative Preparation . . . 287
Preoperative Optimization to Enhance Effectiveness and Decrease Complications . . . 287
Pitfalls and Danger Points . . . 288
Operative Strategy . . . 288
Avoiding Operative Bleeding . . . 288
Avoiding Postoperative Stenosis and Leak . . . 288
Documentation Basics . . . 288
Operative Technique . . . 288
Positioning and Port Placement . . . 288
Mobilization of the Stomach . . . 289
Creation of the Sleeve . . . 289

Leak Test . . . 289
Postoperative Care . . . 290
Complications . . . 290
Further Reading . . . 290

38 Laparoscopic Roux-en-Y Gastric Bypass . . . 291
Katherine M. Meister and Stacy A. Brethauer
Preoperative Preparation . . . 291
Indications . . . 291
Preoperative Examination . . . 291
Pitfalls and Danger Points . . . 291
Documentation . . . 291
Operative Strategy . . . 292
Operative Technique . . . 292
Trocar Placement . . . 292
Division of the Jejunum and Creation of Jejunojejunostomy . . . 292
Creation of the Gastric Pouch . . . 294
Creation of the Gastrojejunostomy . . . 295
Postoperative Care . . . 295
Avoiding Complications . . . 296
Late Complications . . . 296
Further Reading . . . 296

39 Laparoscopic Reoperative Bariatric Surgery . . . 299
Giulio Giambartolomei, Emanuele Lo Menzo, Samuel Szomstein, and Raul J. Rosenthal
Introduction . . . 299
Preoperative Preparation . . . 299
Pitfalls and Danger Points . . . 299
Documentation . . . 300
Operative Strategy . . . 300
Preoperative Preparation . . . 300
Abdominal Entry and Initial Exposure . . . 300
Adhesiolysis . . . 300
Left Liver Lobe Mobilization . . . 301
Diaphragmatic Hiatus Exposure . . . 301
Avoiding Postoperative Complications . . . 301
Operative Technique (Step by Step) . . . 301
Patient Positioning and Trocar Placement . . . 301
Exploration . . . 301
Critical Anatomy Exposure . . . 302
Gastroesophageal Junction Mobilization . . . 302
Types of Reoperations . . . 303
Postoperative Care . . . 304
Complications . . . 304
Further Reading . . . 305

40 Endoscopic Intragastric Balloon . . . 307
Camila B. Ortega, Alfredo D. Guerron, and Dana Portenier
Indications . . . 307
Preoperative Preparation . . . 307
Pitfalls and Danger Points . . . 307
Operative Strategy . . . 307
Operative Technique . . . 308

Placement . . . 308
Diagnostic Endoscopy . . . 308
Insertion of the Uninflated Balloon . . . 308
Confirmatory Endoscopy . . . 308
Balloon Filling . . . 308
Endoscopic Reevaluation . . . 309
Removal . . . 309
Diagnostic Endoscopy . . . 309
Balloon Deflation . . . 309
Removal of the Balloon System . . . 309
Postoperative Care . . . 309
Avoiding Postoperative Complications . . . 310
Complications . . . 310
Minor Complications . . . 310
Major Complications . . . 310
Further Reading . . . 310

Part IV Small Intestine and Appendix
Andreas M. Kaiser

41 Concepts in Surgery of the Small Intestine and Appendix . . . 313
Naelly Saldana Ruiz and Andreas M. Kaiser
Introduction . . . 313
Diagnostics . . . 313
Nonsurgical Treatments . . . 314
Surgical Tools . . . 314
Perioperative Management . . . 314
Diseases . . . 315
Small Bowel Obstruction . . . 315
Small Bowel Tumors . . . 315
Crohn's Disease . . . 316
Appendicitis . . . 317
Small Bowel Diverticula . . . 317
Mesenteric Ischemia . . . 317
Gastrointestinal Bleeding from Small Bowel . . . 318
Trauma . . . 318
Further Reading . . . 318

42 Small Bowel Resection and Anastomosis . . . 321
Naelly Saldana Ruiz and Andreas M. Kaiser
Indications . . . 321
Contraindications . . . 321
Preoperative Preparation . . . 321
Pitfalls and Danger Points . . . 321
Operative Strategy . . . 322
Open Versus Laparoscopic Technique . . . 322
Successful Bowel Anastomosis Requirements . . . 322
Contraindications to Anastomosis . . . 323
Documentation Basics . . . 323
Operative Technique . . . 323
Small Bowel Anastomosis by Suturing . . . 323
Access and Incision . . . 323
Division of Mesentery and Bowel Resection . . . 323
Open Two-Layer Anastomosis . . . 323

Open One-Layer Anastomosis . . . 326
Closure of Mesentery . . . 326
Small Bowel Anastomosis Using Stapling Technique . . . 326
Postoperative Care . . . 327
Complications . . . 327
Further Reading . . . 328

43 Enterolysis for Intestinal Obstruction . . . 329
Naelly Saldana Ruiz and Andreas M. Kaiser
Indications . . . 329
Contraindications . . . 329
Preoperative Preparation . . . 329
Pitfalls and Danger Points . . . 329
Operative Strategy . . . 329
Open Versus Laparoscopic Technique . . . 329
Timing of Intervention . . . 330
Dissection . . . 330
Bowel Decompression . . . 330
Adhesion Prevention . . . 330
Documentation Basics . . . 330
Operative Technique . . . 330
Access, Incision, and Bowel Mobilization . . . 330
Approach to Dense Adhesions . . . 331
Early Re-laparotomy . . . 332
Operative Intestinal Decompression . . . 332
Repair of Damage to Bowel Wall . . . 333
Closure . . . 333
Postoperative Care . . . 333
Complications . . . 333
Further Reading . . . 333

44 Baker Tube Stitchless Plication: Surgical Legacy Technique . . . 335
Carol E. H. Scott-Conner
Indications . . . 335
Preoperative Preparation . . . 335
Pitfalls and Danger Points . . . 335
Operative Strategy . . . 335
Operative Technique . . . 335
Postoperative Care . . . 336
Postoperative Complications . . . 336
Further Reading . . . 336

45 Appendectomy (Open, Laparoscopic) . . . 337
Matthew Zelhart and Andreas M. Kaiser
Indications . . . 337
Possible Indications . . . 337
Contraindications . . . 337
Preoperative Preparation . . . 337
Pitfalls and Danger Points . . . 337
Operative Strategy . . . 337
Documentation Basics . . . 338
Operative Technique . . . 338
Laparoscopic Appendectomy . . . 338
Positioning . . . 338

Incision and Exposure . . . 339
Creating a Window . . . 340
Division of the Meso-appendix . . . 340
Division of Appendix Base . . . 341
Specimen Removal . . . 341
Management of the Retrocecal Appendix . . . 342
Closure . . . 343
Open Appendectomy . . . 343
Incision . . . 343
Delivery of Appendix . . . 344
Division of Meso-Appendix . . . 344
Division of Appendix and Ligation/Inversion of Appendiceal Stump . . . 344
Closure of Incision . . . 346
Postoperative Care . . . 347
Complications . . . 347
Further Reading . . . 347

46 Management of Appendicostomy for Malone Antegrade Continence Enema (MACE) . . . 349
Abigail K. Zamora and Andreas M. Kaiser
Introduction . . . 349
Indications . . . 349
Primary Indication for MACE Procedure . . . 349
Indications for Secondary MACE Management . . . 349
Evaluation and Preparation . . . 350
Pitfalls and Danger Points . . . 350
Operative Strategy . . . 350
Decision-Making . . . 350
Definition of Access . . . 350
Closure of Appendicostomy . . . 351
Preoperative Marking . . . 351
Anesthesia and Positioning . . . 351
Documentation Basics . . . 351
Operative Technique . . . 351
General Considerations . . . 351
MACE Creation: Open Approach . . . 351
MACE Creation: Laparoscopic Approach . . . 352
ACE Creation in Absence of Appendix . . . 352
Revision for Appendicostomy Stricture . . . 352
Appendicostomy Takedown . . . 352
Postoperative Care . . . 353
Complications . . . 353
Further Reading . . . 353

47 Management of Enterocutaneous and Enteroatmospheric Fistulas . . . 355
Kazuhide Matsushima and Demetrios Demetriades
Definitions and Classifications . . . 355
Indications . . . 355
Preoperative Preparation . . . 355
Delineate Fistula Anatomy and Manage Any Intra-abdominal Infections . . . 355
Reduce and Divert Fistula Output . . . 355
Optimize Metabolic and Nutritional Status . . . 357
Pitfalls and Danger Points . . . 357
Operative Strategy . . . 358

Documentation Basics . . . 358
Operative Technique . . . 358
Anesthesia, Positioning, and Instruments . . . 358
Incision and Entering the Abdominal Cavity . . . 358
Abdominal Exploration, Adhesiolysis, and Resection of Enteric Fistulas . . . 359
Abdominal Wall Closure . . . 359
Postoperative Care . . . 359
Complications . . . 359
Further Reading . . . 359

48 Stricturoplasty in Crohn's Disease . . . 361
Gregory K. Low and Andreas M. Kaiser
Indications . . . 361
Contraindications . . . 361
Preoperative Preparation . . . 361
Pitfalls and Danger Points . . . 361
Operative Strategy . . . 362
Documentation Basics . . . 362
Operative Technique . . . 362
Access and Exploration . . . 362
Heineke-Mikulicz Stricturoplasty . . . 362
Finney Stricturoplasty . . . 362
Isoperistaltic Side-to-Side Stricturoplasty . . . 363
Wound Closure and Reconstruction . . . 365
Postoperative Care . . . 365
Complications . . . 365
Further Reading . . . 365

49 Placement of Feeding Tube Jejunostomy . . . 367
Kulmeet K. Sandhu
Indications . . . 367
Contraindications . . . 367
Preoperative Preparation . . . 367
Pitfalls and Danger Points . . . 367
Operative Strategy . . . 367
Anesthesia and Positioning . . . 367
Mobilization of the Small Bowel and Purse-String Placement . . . 367
Feeding Tube Placement and Securing the Jejunum to the Abdominal Wall . . . 367
Documentation Basics . . . 368
Operative Technique . . . 368
Open Placement of Feeding Jejunostomy Tube . . . 368
Laparoscopic Placement of Feeding Jejunostomy Tube . . . 369
Postoperative Care . . . 371
Complications . . . 372
Further Reading . . . 372

50 Creation of Ileostomy (Loop, End) . . . 373
Marjun P. Duldulao and Andreas M. Kaiser
Indications . . . 373
Contraindications . . . 373
Preoperative Preparation . . . 373
Pitfalls and Danger Points . . . 373
Operative Strategy . . . 374
Choice of Procedure and Site . . . 374
Access . . . 374
Proper Ileostomy Configuration . . . 374

Documentation Basics . . . 374
Operative Technique . . . 375
End Ileostomy Creation . . . 375
Preoperative Selection of Ileostomy Site . . . 375
Incision and Creation of a Passage . . . 375
Fashioning the Ileal Mesentery . . . 377
Exteriorization and Closure of Mesenteric Gap . . . 377
"Brooking" the Ileostomy (Eversion and Mucocutaneous Fixation) . . . 377
Loop Ileostomy Creation . . . 377
Incision and Creation of a Passage . . . 377
Exteriorization and Proper Orientation . . . 377
"Brooking" of the Afferent Limb . . . 378
Postoperative Care . . . 379
Complications . . . 379
Further Reading . . . 380

51 Closure of Loop Ileostomy . . . 381
Marjun P. Duldulao and Andreas M. Kaiser
Indications . . . 381
Contraindications . . . 381
Preoperative Preparation . . . 381
Pitfalls and Danger Points . . . 381
Operative Strategy . . . 381
Documentation Basics . . . 382
Operative Technique . . . 382
Incision . . . 382
Fascial Dissection . . . 383
Peritoneal Dissection . . . 383
Stapled Resection and Anastomosis of Ileostomy . . . 383
Hand-Sewn Closure of Enterotomy . . . 384
Closure of Abdominal Wall . . . 384
Management of Skin Wound . . . 385
Postoperative Care . . . 385
Complications . . . 385
Further Reading . . . 385

52 Management of Problems Related to an Existing Continent Ileostomy . . . 387
Erik R. Noren and Andreas M. Kaiser
Indications . . . 387
Evaluation and Preparation . . . 387
Pitfalls and Danger Points . . . 387
Operative Strategy . . . 389
Difficult Stoma Intubation . . . 389
Management During Non-related Surgeries or Incapacitation . . . 389
Considerations for Unrelated Abdominal Surgery . . . 389
Acute Pouch Surgery . . . 389
Chronic Pouch Dysfunction . . . 389
Documentation Basics . . . 390
Operative Technique . . . 390
Endoscopic Pouch Decompression . . . 390
Pouchoscopy . . . 390
Pouch Revision . . . 390
Postoperative Care . . . 390
Complications . . . 390
Further Reading . . . 391

Part V Large Intestine
Andreas M. Kaiser

53 Concepts in Surgery of the Large Intestine . . . 395
Andreas M. Kaiser
Introduction . . . 395
Diagnostics . . . 395
Nonsurgical Treatments . . . 396
Surgical Tools . . . 397
Perioperative Management . . . 397
Diseases . . . 398
Colorectal Polyps . . . 398
Colorectal Cancer . . . 399
Colon Cancer . . . 400
Rectal Cancer . . . 400
Hereditary Cancer Syndromes . . . 402
Carcinomatosis . . . 402
Colorectal Cancer Superimposed on Inflammatory Bowel Disease . . . 402
Anal Cancer . . . 403
Diverticulitis . . . 403
Large Bowel Obstruction . . . 404
Fistulization (Bladder, Vagina, Skin) . . . 405
Lower GI Bleeding . . . 406
Ischemia . . . 406
Inflammatory Bowel Disease . . . 406
Ulcerative Colitis . . . 406
Crohn Disease . . . 407
Indeterminate Colitis . . . 407
C. difficile Colitis and Other Colitides . . . 407
Volvulus . . . 408
Pelvic Floor Dysfunction and Organ Prolapse . . . 408
Stoma Creation and/or Takedown . . . 409
References . . . 410

54 Minimally Invasive Surgery (MIS) in Colorectal Surgery . . . 413
Sarah M. Popek, Rodrigo Rodriguez, and Andreas M. Kaiser
Implementation and Benefits of MIS . . . 413
How Is MIS Approach Different From Open Surgery? . . . 413
Minimally Invasive Surgery (MIS) Platforms . . . 414
Conventional Laparoscopic Surgery (CLS) . . . 414
Hand-Assisted Laparoscopic Surgery (HALS) . . . 415
Three-Dimensional Laparoscopic Surgery . . . 416
Single Incision Laparoscopic Surgery (SILS) . . . 416
Robotic Surgery . . . 416
Strategies About Selection of the Surgical Approach . . . 417
Challenges . . . 418
Training Aspects . . . 418
Conclusion . . . 418
Further Reading . . . 418

55 Endoscopic Techniques for Colorectal Lesions . . . 421
Anna Skay and Jacques Van Dam
Indications . . . 421
Preoperative Preparation . . . 421

Pitfalls and Danger Points . . . 421
Operative Strategy . . . 421
Polyp Detection . . . 421
Dye-Assisted Chromocolonoscopy . . . 421
New Colonoscope Technology . . . 422
Endoscopic Mucosal Resection . . . 424
Documentation Basics . . . 424
Operative Technique . . . 424
EMR Technique . . . 424
Recurrent or Remaining Adenoma . . . 424
Hemostasis . . . 424
Perforation . . . 425
Tattoo Placement . . . 425
Endoscopic Submucosal Dissection . . . 425
Colonic Stent Placement . . . 425
Postoperative Care . . . 425
Complications . . . 425
Further Reading . . . 426

56 Right and Extended Right Hemicolectomy (Open, Laparoscopic) . . . 427
Matthew Zelhart and Andreas M. Kaiser
Indications . . . 427
Preoperative Preparation . . . 427
Pitfalls and Danger Points . . . 427
Operative Strategy . . . 427
Localization of Target Lesion . . . 427
Surgical Approach . . . 428
Extent of the Resection . . . 428
Vascular Transection . . . 428
Colon Mobilization . . . 428
Colon Resection . . . 428
Documentation Basics . . . 430
Operative Technique . . . 430
Positioning . . . 430
Operative Approach and Incisions . . . 431
Minimally Invasive Surgery . . . 431
Open Approach . . . 431
Exploration . . . 431
Identification of the Ureter . . . 431
Division of the Ileocolic Vessels . . . 433
Colon Mobilization . . . 433
Division of the Middle Colic Vessels . . . 434
Mesentery and Omentum Roundup . . . 434
Division of Ileum and Colon . . . 435
Ileo-colonic Anastomosis . . . 435
Hand-Sewn End-to-End . . . 435
Stapled Functional End-to-End Anastomosis . . . 436
Stapled Isoperistaltic Side-to-Side Anastomosis . . . 438
Wound Closure . . . 439
Postoperative Care . . . 439
Complications . . . 441
Further Reading . . . 441

57 Sigmoid Resection and Left Hemicolectomy (Open, Laparoscopic) 443
Matthew Zelhart and Andreas M. Kaiser
Indications 443
Preoperative Preparation 443
Pitfalls and Danger Points 443
Operative Strategy 445
Localization of Target Lesion 445
Surgical Approach 445
Extent of the Resection 445
Vascular Transection 445
Colon Mobilization 445
Colon Resection 446
The Difficult Reach 446
Technique of Anastomosis 446
Documentation Basics 446
Operative Technique 446
Positioning 446
Operative Approach and Incisions 446
Minimally Invasive Surgery 446
Open Approach 447
Exploration 447
Identification of the Ureter 448
Division of the Inferior Mesenteric Artery Pedicle 448
Colon Mobilization 449
Medial to Lateral Approach 449
Lateral to Medial Approach 451
Splenic Flexure Mobilization 451
Division of the Middle Colic Vessels 452
Mesentery and Omentum Roundup 452
Division of the Bowel 452
Anastomosis 453
Stapled End-to-End Anastomosis 453
Hand-Sewn End-to-End 455
Reversed Stapled Circular Stapler Anastomosis 455
Wound Closure 455
Postoperative Care 455
Complications 455
Further Reading 458

58 Discontinuous Colon Resection (Hartmann Procedure) 459
Matthew Zelhart and Andreas M. Kaiser
Indications 459
Acute 459
Elective 459
Contraindications 459
Preoperative Preparation 459
Pitfalls and Danger Points 459
Operative Strategy 460
Surgical Approach 460
Extent of the Resection 460
Bowel Control and Decompression 460
Colon Mobilization 460
Vascular Transection 460

Colon Resection . . . 460
The Difficult Reach . . . 460
Documentation Basics . . . 461
Operative Technique . . . 461
Positioning . . . 461
Incision . . . 461
Exploration . . . 461
Colon Mobilization . . . 461
Identification of the Ureter . . . 462
Division of the Inferior Mesenteric Artery Pedicle . . . 462
Division of Mesentery and Bowel . . . 462
Hartmann's Pouch Versus Mucous Fistula . . . 462
End Colostomy . . . 463
Wound Closure . . . 463
Postoperative Care . . . 463
Complications . . . 463
Further Reading . . . 463

59 Total Mesorectal Excision/Low Anterior Resection (Open, Laparoscopic) . . . 465
Kyle G. Cologne, Anthony J. Senagore, and Andreas M. Kaiser
Indications . . . 465
Preoperative Preparation . . . 465
Pitfalls and Danger Points . . . 465
Operative Strategy . . . 466
Localization of Target Lesion . . . 466
Surgical Approach . . . 466
Oncologic Extent of Resection . . . 466
Mesorectal Dissection . . . 467
Avoiding Collateral Damage . . . 467
Prevention of Anastomotic Complications . . . 468
The Difficult Reach . . . 468
Technique of Anastomosis . . . 469
Indications for Diverting Stoma (Colostomy or Ileostomy) . . . 469
Documentation Basics . . . 469
Operative Technique . . . 469
Positioning . . . 469
Operative Approach and Incisions . . . 470
Minimally Invasive Surgery . . . 470
Open Approach . . . 470
Exploration . . . 471
Initial Colorectal Mobilization . . . 471
Identification of the Ureters . . . 472
Division of the Blood Supply (IMA Pedicle, Mesentery) . . . 472
Proximal Bowel Transection . . . 473
Splenic Flexure Mobilization . . . 473
Pelvic and Presacral Dissection . . . 473
Pelvic Hemostasis . . . 475
Distal Rectal Transection . . . 476
Irrigation of Rectal Stump . . . 476
Anastomosis . . . 476
Double Stapled Anastomosis (Abdominal and Perineal Access) . . . 476
Hand-Sewn Colo-anal Anastomosis (Perineal Access) . . . 477
Reversed Stapled Circular Stapler Anastomosis (Abdominal Access) . . . 477

Variations of Colo-anal Anastomosis (To Improve Short-Term Function) 478
Pitfalls, Danger Points, and Troubleshooting Stapled Anastomoses 478
Wound Closure 479
Postoperative Care 479
Complications 479
Further Reading 480

60 Abdominoperineal Resection (Open, Laparoscopic) 481
Kyle G. Cologne, Sean J. Langenfeld, and Andreas M. Kaiser
Indications 481
Preoperative Preparation 481
Pitfalls and Danger Points 482
Operative Strategy 482
Extent of the Perineal Resection 482
Abdominal Phase 482
Surgical Approach 482
Colostomy 482
Perineal Dissection 482
Pelvic Defect Management 483
Documentation Basics 483
Operative Technique 483
Positioning 483
Operative Approach and Incisions 483
Minimally Invasive Surgery 483
Open Approach 483
Abdominal Dissection and Colostomy Creation 484
Cylindrical Abdominoperineal Resection (Malignant) 485
Abdominal Part 485
Perineal Dissection 485
Management of Pelvic Floor 487
Abdominoperineal Resection (Benign) 487
Abdominal Part 488
Perineal Dissection 488
Closure of the Perineal Wound 488
Abdominal Wound Closure 488
Colostomy 489
Postoperative Care 489
Complications 490
Further Reading 490

61 Multivisceral Resections (Pelvic Exenteration) 491
Gregory K. Low and Andreas M. Kaiser
Indications 491
Contraindications 491
Preoperative Preparation 491
Pitfalls and Danger Points 491
Operative Strategy 492
Anesthesia and Patient Positioning 492
Operative Phases 492
Documentation Basics 492
Operative Technique 492
Incision and Exploration 492
Peritoneal Incision and Identification of the Ureters 493

Ligation of the Inferior Mesenteric Artery . . . 493
Proximal Division of the Sigmoid Colon . . . 493
Pelvic Dissection . . . 493
Posterior Pelvic Dissection . . . 493
Lateral Pelvic Sidewall Dissection . . . 493
Anterior Dissection . . . 494
Distal Transection Versus Abdomino-Perineal Resection . . . 494
Harvest of VRAM Flap and Abdominal Wall Reconstruction . . . 494
Urinary Reconstruction . . . 494
Creation of Intestinal Stoma . . . 495
Wound Closure and Reconstruction . . . 495
Postoperative Care . . . 495
Complications . . . 496
Further Reading . . . 496

62 (Sub-)Total Colectomy with Ileostomy or Ileo-Rectal Anastomosis (Open, Laparoscopic) . . . 497
Kyle G. Cologne, Theodor Asgeirsson, and Andreas M. Kaiser
Indications . . . 497
Emergency . . . 497
Staged . . . 497
Elective . . . 497
Preoperative Preparation . . . 497
All . . . 497
Elective . . . 497
Emergency . . . 498
Pitfalls and Danger Points . . . 498
Operative Strategy . . . 498
General . . . 498
Surgical Approach . . . 498
Bowel Manipulation . . . 498
Extent and Steps of the Resection . . . 498
Anastomosis Versus Ileostomy . . . 499
Documentation Basics . . . 499
Operative Technique . . . 499
Positioning . . . 499
Operative Approach and Incisions . . . 499
Open Approach . . . 499
Minimally Invasive Surgery . . . 499
Exploration . . . 500
Evacuation of Stool . . . 500
Mobilization and Resection . . . 500
Total Colectomy . . . 500
Distal Bowel Transection . . . 501
Anastomosis Versus Ileostomy . . . 502
Ileo-Rectal (Ileo-Sigmoid) Anastomosis . . . 502
End Ileostomy . . . 502
Ileostomy and Mucous Fistula . . . 502
Drains . . . 503
Wound Closure . . . 503
Postoperative Care . . . 503
Complications . . . 503
Further Reading . . . 503

63 Proctocolectomy with Ileal Pouch-Anal Anastomosis (IPAA) or End Ileostomy (Open, Laparoscopic) 505
Kyle G. Cologne, Anthony J. Senagore, and Andreas M. Kaiser
Indications for Proctocolectomy 505
Contraindications for Pouch Creation 505
Preoperative Preparation 505
Pitfalls and Danger Points 506
Operative Strategy 506
Surgical Approach 506
Extent and Steps of the Resection 506
Terminal Ileal Dissection 507
Rectal Dissection 507
Continence Factors 507
The Difficult Reach 507
Constructing the Ileal Reservoir (Pouch) 508
Technique of Pouch-Anal Anastomosis 508
Indications for Diverting Ileostomy 508
Documentation Basics 508
Operative Technique 508
Positioning 508
Operative Approach and Incisions 508
Minimally Invasive Surgery 508
Open Approach 508
Exploration 509
Mobilization and Resection 509
Total Colectomy 509
Proctectomy 509
Constructing the Ileal Reservoir (J-Pouch) 510
Ileoanal Anastomosis 511
Pitfalls, Danger Points, and Troubleshooting Stapled Anastomoses 512
Loop Ileostomy 512
Wound Closure 512
Postoperative Care 512
Complications 513
Further Reading 514

64 Cecostomy: Surgical Legacy Technique 515
Andreas M. Kaiser and Carol E. H. Scott-Conner
Indications 515
Preoperative Preparation 515
Pitfalls and Danger Points 515
Operative Strategy 515
Documentation Basics 515
Operative Technique 516
Tube Cecostomy 516
Skin-Sutured Cecostomy 516
Incision 516
Exploration of Cecum 516
Cecal Fixation 516
Mucocutaneous Suture 516
Postoperative Care 517
Complications 517
Further Reading 517

65 Creation of Transverse Colostomy (Loop, Prasad-Type) 519
Constantine P. Spanos and Andreas M. Kaiser
Indications 519
Contraindications 519
Preoperative Preparation 519
Pitfalls and Danger Points 519
Operative Strategy 520
Choice of Procedure 520
Access 520
Diversion of Fecal Stream 520
Documentation Basics 520
Operative Technique 521
Incision 521
Identification and Exteriorizing of Transverse Colon 521
Choice of Bridge 522
Maturation of Colostomy 523
Prasad-Type Colostomy 523
Postoperative Care 524
Complications 524
Further Reading 524

66 Laparoscopic Versus Open Creation of Sigmoid Colostomy (Loop, Prasad-Type, End) 525
Constantine P. Spanos and Andreas M. Kaiser
Indications 525
Contraindications 525
Preoperative Preparation 525
Pitfalls and Danger Points 525
Operative Strategy 526
Choice of Procedure and Site 526
Access 526
Type of Fecal Diversion 526
Documentation Basics 526
Operative Technique 526
Incision, Identification, and Mobilization of the Sigmoid Colon 526
Open—Through Laparotomy 526
Open—Through Colostomy Site Only 527
Laparoscopic 527
Stoma Orientation 529
Abdominal Wall Reinforcement (Hernia Prevention) 529
Choice of Bridge 529
Maturation of Colostomy 529
Loop Colostomy 529
Prasad-Type Colostomy 529
End Colostomy 530
Postoperative Care 530
Complications 530
Further Reading 530

67 Closure of Temporary Loop Colostomy or Ileostomy 531
Constantine P. Spanos and Andreas M. Kaiser
Indications 531
Contraindications 531
Preoperative Preparation 531

Pitfalls and Danger Points . . . 531
Operative Strategy . . . 531
Documentation Basics . . . 532
Operative Technique . . . 532
Anesthesia and Positioning . . . 532
Incision . . . 532
Fascial Dissection . . . 532
Peritoneal Dissection . . . 533
Strategies for the Difficult Dissection . . . 533
Bowel Anastomosis . . . 533
Resection with Stapled Side-to-Side (Functional End-to-End) Anastomosis . . . 533
Simple Closure of Antimesenteric Bowel Wall Opening . . . 534
Resection and End-to-End Anastomosis . . . 535
Resection and Isoperistaltic Side-to-Side Anastomosis . . . 535
Closure of Abdominal Wall . . . 535
Management of Skin Wound . . . 535
Postoperative Care . . . 535
Complications . . . 536
Further Reading . . . 536

68 Hartmann Reversal (Open, Laparoscopic) . . . 537
Kasim L. Mirza and Andreas M. Kaiser
Indications . . . 537
Contraindications . . . 537
Preoperative Preparation . . . 537
Pitfalls and Danger Points . . . 537
Operative Strategy . . . 538
Decision to Offer Hartmann Reversal . . . 538
Choice of Approach: Open Versus Laparoscopic . . . 538
Laparoscopic Access . . . 539
Open Access . . . 539
Colonic Mobilization . . . 539
Rectal Stump Mobilization . . . 539
Diverting Fecal Stream . . . 539
Documentation Basics . . . 539
Operative Technique . . . 539
Open Hartmann Reversal . . . 540
Laparoscopic Hartmann Reversal . . . 541
Postoperative Care . . . 542
Complications . . . 542
Further Reading . . . 542

69 Surgeries for Large Bowel Obstruction . . . 543
Joseph Nunoo-Mensah, Vita Klimasauskiene, and Andreas M. Kaiser
Introduction . . . 543
Preoperative Preparation . . . 543
Pitfalls and Danger Points . . . 543
Stenting . . . 543
Non-resective Approach (Stent, Diverting Stoma) . . . 544
Resection . . . 544
Operative Strategy . . . 544
Conservative Management . . . 544
Decision for Surgery . . . 544

Choice of the Platform . . . 544
Specific Considerations for the Stated Options Are as Follows . . . 545
Setup and Patient Positioning . . . 545
Documentation Basics . . . 546
Operative Technique . . . 546
Positioning . . . 546
Colonic Stenting . . . 546
Creation of Colostomy . . . 546
Discontinuous Resection with Creation of a Stoma . . . 547
Segmental or Subtotal Resection . . . 547
Segmental Resection with Intraoperative Colonic Lavage and Anastomosis . . . 547
Postoperative Care . . . 548
Complications . . . 548
Further Reading . . . 548

70 Surgery for Colonic Fistula to Bladder, Vagina, or Skin . . . 551
Marjun P. Duldulao and Andreas M. Kaiser
Indications . . . 551
Contraindications . . . 551
Preoperative Preparation . . . 551
Pitfalls and Danger Points . . . 551
Operative Strategy . . . 552
Decision for Surgery . . . 552
Definitive Surgery . . . 552
Access . . . 552
Diversion . . . 552
Documentation Basics . . . 552
Operative Technique . . . 552
Access . . . 552
Definitive Bowel Resection . . . 553
Management of the Other Organ . . . 553
Malignant . . . 553
Benign . . . 553
Diversion . . . 554
Postoperative Care . . . 554
Complications . . . 554
Further Reading . . . 554

71 Abdominal Repair of Rectal Prolapse and Pelvic Organ Descent (Open, Laparoscopic) . . . 555
Joongho Shin, Gregory K. Low, and Andreas M. Kaiser
Indications . . . 555
Preoperative Preparation . . . 555
Pitfalls and Danger Points . . . 555
Operative Strategy . . . 555
Concept of the Repair . . . 555
Surgical Approach . . . 556
Rectal Mobilization . . . 556
Posterior . . . 556
Anterior . . . 556
Avoiding Collateral Damage . . . 556
Selection of Implant . . . 557
Documentation Basics . . . 557
Operative Technique . . . 557

Positioning . . . 557
Operative Approach and Incisions . . . 557
Minimally Invasive Surgery . . . 557
Open Approach . . . 557
Posterior Rectal Mobilization and Fixation . . . 558
Posterior Rectopexy with Mesh (Wells) . . . 558
Posterior Suture Rectopexy (without Implant) . . . 559
Legacy Procedure: Ripstein Rectopexy (Obsolete) . . . 560
Ventral Mesh Rectopexy . . . 560
Segmental Colon Resection with Rectopexy . . . 561
Multicompartmental Resuspension . . . 561
Wound Closure . . . 561
Postoperative Care . . . 561
Complications . . . 561
Further Reading . . . 562

Part VI Anus, Rectum, and Pilonidal Region
Andreas M. Kaiser

72 Concepts in Surgery of the Anus, Rectum, and Pilonidal Region . . . 565
Rachel Hogen and Andreas M. Kaiser
Introduction . . . 565
Anatomy and Physiology . . . 565
Diagnostics . . . 566
Anorectal Examination . . . 566
Imaging . . . 566
Functional Testing . . . 566
Management . . . 567
Nonsurgical Treatments . . . 567
Surgical Tools . . . 567
Anesthesia and Positioning . . . 567
Perioperative Management . . . 567
Clinical Conditions . . . 568
Anorectal Pain . . . 568
Hemorrhoids . . . 568
Anal Fissure . . . 568
Anorectal Suppurative Diseases . . . 569
Pilonidal Disease . . . 570
Hidradenitis Suppurativa . . . 570
Rectal Prolapse . . . 570
Anorectal Stricture . . . 570
Functional Disorders . . . 571
Anorectal Skin Pathology . . . 571
Further Reading . . . 571

73 Office Procedures for Internal Hemorrhoids (Sclerotherapy, Infrared Coagulation, and Rubber Band Ligation) . . . 573
Marjun P. Duldulao and Andreas M. Kaiser
Indications . . . 573
Contraindications . . . 573
Preoperative Preparation . . . 573
Pitfalls and Danger Points . . . 573
Operative Strategy . . . 573
Documentation Basics . . . 574

Operative Technique . . . 574
Sclerotherapy . . . 574
Infrared Coagulation . . . 574
Rubber Band Ligation . . . 575
Postoperative Care . . . 575
Complications . . . 575
Further Reading . . . 576

74 Excisional Hemorrhoidectomy (Ferguson, Milligan-Morgan, Whitehead) . . . 577
Joseph Nunoo-Mensah, Vita Klimasauskiene, and Andreas M. Kaiser
Indications . . . 577
Contraindications . . . 577
Evaluation and Preparation . . . 577
Pitfalls and Danger Points . . . 578
Operative Strategy . . . 578
Considering Alternative Pathologies . . . 578
Anesthesia and Positioning . . . 578
Avoiding Anal Stenosis . . . 578
Achieving Hemostasis . . . 578
Avoiding Fecal Incontinence . . . 578
Documentation Basics . . . 579
Operative Technique . . . 579
General Setting . . . 579
Positioning and Setup . . . 579
Local Anesthetic Block . . . 579
Excisional Hemorrhoidectomy . . . 579
Ferguson Technique (Closed Wounds) . . . 579
Milligan-Morgan Technique (Open Wounds) . . . 581
Whitehead Hemorrhoidectomy . . . 581
Postoperative Care . . . 581
Complications . . . 582
Further Reading . . . 582

75 Stapled Hemorrhoidectomy/-opexy . . . 583
Erik R. Noren and Sang W. Lee
Indications . . . 583
Contraindications . . . 583
Evaluation and Preparation . . . 583
Pitfalls and Danger Points . . . 583
Operative Strategy . . . 584
Anesthesia and Positioning . . . 584
Placement of the Retractor and Reduction of Prolapse . . . 584
Purse-String Suture Placement and Transection of the Rectal Mucosa . . . 584
Avoiding Postoperative Complications . . . 584
Documentation Basics . . . 584
Operative Technique . . . 584
Stapler Sets and Instruments . . . 584
Placement of the Retractor and Reduction of Prolapse . . . 585
Purse-String Suture Placement and Transection of the Rectal Mucosa . . . 585
Inspection for Hemostasis and Removal of Retractor . . . 587
Postoperative Care . . . 587
Complications . . . 587
Further Reading . . . 587

76 Doppler-Guided Hemorrhoidal Artery Ligation 589
Constantine P. Spanos and Andreas M. Kaiser
Indications 589
Contraindications 589
Preoperative Preparation 589
Pitfalls and Danger Points 589
Operative Strategy 589
Selection of the Treatment Method 590
Anesthesia and Positioning 590
Documentation Basics 590
Operative Technique 590
Doppler-Guided Ligation 590
Mucopexy 591
Postoperative Care 591
Complications 591
Further Reading 591

77 Surgical Management of Anorectal Abscess and Fistula 593
Rachel Hogen and Andreas M. Kaiser
Indications 593
Preoperative Preparation 593
Pitfalls and Danger Points 593
Operative Strategy 594
Choice of Anesthesia 594
Positioning 594
Localizing Fistula Tracts 594
Preserving Fecal Continence 594
Combining Fistula Surgery with Drainage of Anorectal Abscess 594
Anorectal Infections in Crohn's Disease and Leukemia 595
Documentation Basics 595
Operative Technique 595
Perianal and Ischioanal Abscess 595
Intersphincteric Abscess 595
Supralevator Abscess 596
Anorectal Fistula 596
Fistulotomy Versus Seton Placement 599
Endorectal Advancement Flap (ERAF) 600
Insertion of Fistula Plug 600
Ligation of Intersphincteric Fistula Tract (LIFT) 600
More Extensive Surgeries 600
Postoperative Care 600
Complications 601
Further Reading 601

78 Rectovaginal Fistula Repair 603
Rahila Essani and Andreas M. Kaiser
Indications 603
Contraindications 603
Preoperative Preparation 603
Pitfalls and Danger Points 603
Operative Strategy 604
Timing of the Repair 604
Immediate Symptom Control 604

Common Local Rectovaginal Repairs . . . 604
Radical Local Repair Operations . . . 604
Abdominal Approach . . . 604
Documentation Basics . . . 604
Operative Technique . . . 604
Perineal Approaches . . . 604
General Considerations . . . 604
Endorectal Advancement Flap (ERAF) . . . 605
Episioproctotomy with Layered Closure . . . 606
Perineal Access and Muscle Interposition . . . 606
Miscellaneous Perineal Approaches . . . 606
Abdominal Approach . . . 606
Postoperative Care . . . 607
Complications . . . 607
Further Reading . . . 607

79 Rectourinary Fistula Repair . . . 609
Gregory K. Low and Andreas M. Kaiser
Indications . . . 609
Contraindications . . . 609
Preoperative Preparation . . . 609
Pitfalls and Danger Points . . . 609
Operative Strategy . . . 609
Immediate Symptom Control . . . 609
Perineal Local Rectourinary Repair . . . 610
Abdominal Local Rectourinary Repair . . . 610
Abdominal and Abdomino-perineal Resection . . . 610
Documentation Basics . . . 610
Operative Technique . . . 610
Perineal Approach . . . 610
Transanal Access . . . 610
Parasacral-Transsphincteric Access (York-Mason) . . . 610
Perineal Access and Muscle Interposition . . . 610
Abdominal Approach . . . 611
Postoperative Care . . . 611
Complications . . . 611
Further Reading . . . 611

80 Lateral Internal Sphincterotomy with/Without Fissurectomy for Chronic Anal Fissure . . . 613
Constantine P. Spanos and Andreas M. Kaiser
Indications . . . 613
Contraindications . . . 613
Preoperative Preparation . . . 613
Pitfalls and Danger Points . . . 613
Operative Strategy . . . 613
Patient Selection . . . 613
Goal of Surgery . . . 614
Optional Steps . . . 614
Documentation Basics . . . 614
Operative Technique . . . 614
Anesthesia and Positioning . . . 614
Closed Sphincterotomy . . . 614

Open Sphincterotomy . . . 615
Fissurectomy and Removal of the Sentinel Pile and/or Hypertrophic Anal Papilla . . . 615
Concomitant Hemorrhoidectomy . . . 615
Postoperative Care . . . 616
Complications . . . 616
Further Reading . . . 616

81 Anoplasty for Anal Stenosis . . . 617
Andreas M. Kaiser
Indications . . . 617
Preoperative Preparation . . . 617
Pitfalls and Danger Points . . . 617
Operative Strategy . . . 617
Documentation Basics . . . 617
Operative Technique . . . 617
Mucosal Advancement Flap . . . 618
Anocutaneous Advancement Flap (V-Y Plasty) . . . 618
Postoperative Care . . . 618
Fluids . . . 618
Wound Care . . . 618
Regular Diet . . . 618
Stool Management . . . 618
Pain Management . . . 618
Complications . . . 618
Further Reading . . . 619

82 Perineal Operations for Rectal Prolapse . . . 621
Constantine P. Spanos and Andreas M. Kaiser
Indications . . . 621
Contraindications . . . 621
Preoperative Preparation . . . 621
Pitfalls and Danger Points . . . 622
Altemeier Procedure . . . 622
Delorme Procedures . . . 622
Thiersch Procedure: Pitfalls and Danger Points . . . 622
Operative Strategy . . . 622
Choice of Procedure . . . 622
Patient Positioning . . . 622
Anesthesia . . . 622
Operative Tactics . . . 622
Perineal Proctosigmoidectomy (Altemeier Procedure) . . . 622
Mucosal Sleeve Resection with Muscular Cuff Plication (Delorme Procedure) . . . 623
Thiersch Operation (Surgical Legacy Procedure) . . . 623
Documentation Basics . . . 623
Operative Technique . . . 623
Altemeier Procedure: Perineal Proctosigmoidectomy . . . 623
Delorme Procedure: Mucosal Sleeve Resection with Muscular Plication . . . 625
Thiersch Operation (Surgical Legacy Procedure) . . . 626
Postoperative Care . . . 627
Complications . . . 627
Further Reading . . . 628

83 Operations for Pilonidal Disease . . . 629
Marjun P. Duldulao and Andreas M. Kaiser
Indications . . . 629
Preoperative Preparation . . . 629
Pitfalls and Danger Points . . . 629
Operative Strategy . . . 629
Documentation Basics . . . 629
Operative Technique . . . 630
Abscess Drainage Without Excision . . . 630
Excision of Sinus Pits with Lateral Drainage . . . 630
Primarily Wide Open Excision with/Without Marsupialization . . . 630
Excision with Primary Closure . . . 631
Excision with Flap Closure . . . 631
Postoperative Care . . . 632
Complications . . . 632
Further Reading . . . 632

84 Overlapping Sphincteroplasty . . . 633
Meara Dean and Massarat Zutshi
Indications . . . 633
Contraindications . . . 633
Preoperative Preparation . . . 633
Pitfalls and Danger Points . . . 633
Operative Strategy . . . 633
General Considerations . . . 633
Timing of the Repair . . . 634
Technical Considerations . . . 634
Measuring the Results . . . 634
Persistent Incontinence . . . 634
Documentation Basics . . . 634
Operative Technique . . . 634
General Setting . . . 634
Positioning and Setup . . . 634
Incision . . . 635
Mobilization . . . 635
Reconstruction . . . 635
Wound Closure . . . 635
Postoperative Care . . . 635
Complications . . . 636
Further Reading . . . 637

85 Sacral Nerve Stimulation for Fecal and Urinary Incontinence . . . 639
Meara Dean and Massarat Zutshi
Indications . . . 639
Contraindications . . . 639
Preoperative Preparation . . . 639
Pitfalls and Danger Points . . . 639
Operative Strategy . . . 639
General Considerations . . . 639
Anesthesia and Positioning . . . 640
Phase 1 . . . 640
Phase 2 . . . 640

Documentation Basics . . . 640
Operative Technique . . . 641
Phase 1 . . . 641
Plan Incision . . . 641
Localizing the Foramina . . . 641
Confirming Needle Position . . . 641
Introducing Wire, Dilator, and Lead . . . 642
Wound Closure . . . 643
Phase 2 . . . 643
Removing the Temporary External Lead Extension . . . 643
Connecting the Lead to the Neurostimulator . . . 643
Wound Closure . . . 643
Postoperative Care . . . 644
Complications . . . 644
Further Reading . . . 644

86 Transanal Local Excision of Rectal Lesions (TEMS, TAMIS, TAE) . . . 645
Christine Hsieh and Andreas M. Kaiser
Indications . . . 645
Contraindications . . . 646
Preoperative Preparation . . . 646
Pitfalls and Danger Points . . . 646
Operative Strategy . . . 646
Depth of Excision . . . 646
Choice of the Platform . . . 646
Transanal Excision (TAE) . . . 646
Transanal Endoscopic Microsurgery (TEMS) . . . 647
Transanal Minimally Invasive Surgery (TAMIS) . . . 647
Transanal Total Mesorectal Excision (taTME) . . . 647
Anesthesia . . . 647
Patient Positioning . . . 647
Documentation Basics . . . 648
Operative Technique . . . 648
Positioning . . . 648
Anal Block . . . 648
Surgical Excision . . . 648
Transanal Excision . . . 648
Transanal Endoscopic Microsurgery (TEMS) . . . 649
Transanal Minimally Invasive Surgery (TAMIS) . . . 649
Specimen Handling . . . 649
Postoperative Care . . . 650
Complications . . . 651
Further Reading . . . 651

Part VII Hepatobiliary Tract
Umut Sarpel

87 Concepts in Hepatobiliary Surgery . . . 655
Umut Sarpel and H. Leon Pachter
Biliary Surgery . . . 655
Biliary Colic and Cholecystitis . . . 655
Cholecystitis During Pregnancy . . . 656
Cholecystitis in the Hospitalized Patient . . . 656
Cholecystectomy . . . 656

Intraoperative Cholangiography . . . 657
Use of Drains . . . 657
Iatrogenic Biliary Injury . . . 657
Choledocholithiasis and Cholangitis . . . 658
Ductal Drainage Procedures . . . 658
T-Tube Management . . . 659
Gallbladder Carcinoma . . . 659
Cholangiocarcinoma . . . 659
Hepatic Surgery . . . 660
Hepatocellular Carcinoma . . . 660
Colorectal Liver Metastases . . . 660
Hepatic Trauma . . . 661
Concepts in Liver Resection . . . 661
Determining Resectability . . . 662
Hemostasis . . . 662
Use of Drains . . . 662
Postoperative Management . . . 663
References . . . 663

88 Open Cholecystectomy . . . 665
Shanel B. Bhagwandin and Umut Sarpel
Indications . . . 665
Relative Contraindications . . . 665
Preoperative Preparation . . . 665
Pitfalls and Danger Points . . . 665
Operative Strategy . . . 665
Anomalies of the Extrahepatic Bile Ducts . . . 665
Avoiding Injury to the Bile Ducts . . . 667
Inadvertent Ligation of the Hepatic Artery . . . 669
Avoiding Hemorrhage . . . 669
Cholangiography . . . 670
Common Errors of Operative Cholangiography . . . 670
Decompressing the Gallbladder . . . 671
Management of the Difficult Cystic Duct . . . 671
Subtotal Cholecystectomy . . . 671
Conversion to Open Cholecystectomy After Failed Laparoscopic Cholecystectomy . . . 672
Operative Technique . . . 672
Incision . . . 672
Dissecting the Cystic Duct . . . 673
Cystic Duct Cholangiography . . . 673
Ligating the Cystic Artery . . . 673
Dissecting the Gallbladder Bed . . . 673
Drainage and Closure . . . 675
Postoperative Care . . . 675
Complications . . . 675
Further Reading . . . 676

89 Laparoscopic Cholecystectomy . . . 677
Cindi Sulzbach and Randall Zuckerman
Indications . . . 677
Contraindications . . . 677
Preoperative Preparation . . . 677
Choledocholithiasis . . . 677
Pitfalls and Danger Points . . . 677

Operative Strategy . . . 677
Avoiding Bleeding . . . 677
Preventing Bile Duct Damage . . . 678
Aberrant Anatomy . . . 679
Ensuring Good Exposure . . . 679
Intraoperative Cholangiography . . . 680
Conversion to Open Cholecystectomy . . . 680
Operative Technique . . . 680
Initial Inspection of the Peritoneal Cavity . . . 680
Insertion of Secondary Trocar Cannulas . . . 680
Dissecting the Gallbladder to Expose the Cystic Duct . . . 681
Cystic Duct Cholangiogram . . . 682
Removing the Gallbladder . . . 683
Postoperative Care . . . 684
Complications . . . 684
Needle or Trocar Damage . . . 684
Insufflation-Related Complications . . . 684
Bile Duct Damage: Injury of Common and Hepatic Ducts . . . 684
Bile Leak . . . 686
Intraoperative Hemorrhage from Cystic Artery . . . 686
Further Reading . . . 687

90 Open and Laparoscopic Common Bile Duct Exploration . . . 689
Juliane Bingener, Michael G. Sarr, and Carol E. H. Scott-Conner
Indications . . . 689
Preoperative Preparation . . . 689
Pitfalls and Danger Points . . . 689
Operative Strategy . . . 690
Avoiding Postoperative Pancreatitis . . . 690
CBD Perforations . . . 690
Locating and Removing Biliary Calculi . . . 690
Documentation Basics . . . 692
Open CBD Exploration: Operative Technique . . . 692
Cholangiography . . . 692
Kocher Maneuver . . . 693
Choledochotomy Incision . . . 693
Choledochoscopy . . . 693
Transduodenal Sphincterotomy/Sphincteroplasty for Impacted Stones . . . 694
Checking for Ampullary Stenosis . . . 695
Insertion of the T-Tube . . . 695
Completion Cholangiogram . . . 696
Drainage and Closure . . . 696
Laparoscopic CBD Exploration: Operative Technique . . . 696
Postoperative Care . . . 697
Complications . . . 698
Bile Leak and Bile Peritonitis . . . 698
Postoperative Acute Pancreatitis . . . 698
Increasing Jaundice . . . 698
Hemorrhage (Hemobilia) . . . 698
Residual CBD Stone Postoperatively . . . 698
Early Postoperative Treatment . . . 698
Subsequent Postoperative Treatment . . . 699
Further Reading . . . 699

91 Sphincteroplasty . . . 701
Renganaden Sooppan and Charles J. Yeo
Indications . . . 701
Preoperative Preparation . . . 701
Pitfalls and Danger Points . . . 701
Operative Strategy . . . 701
Duodenotomy . . . 701
Preventing Duodenal or CBD Leak . . . 701
Identifying and Protecting the Pancreatic Duct . . . 702
Closure of Duodenotomy . . . 702
Operative Technique . . . 702
Incision and Exploration . . . 702
Mobilization of the Gallbladder and Kocher Maneuver . . . 702
Location of the Ampulla of Vater and Duodenotomy . . . 702
Mucosal Resection of Periampullary Adenoma . . . 703
Bile Duct Sphincteroplasty . . . 703
Pancreatic Ductoplasty and Septotomy . . . 704
Completing the Cholecystectomy and Closing the Duodenotomy . . . 705
Drainage and Abdominal Closure . . . 705
Postoperative Care . . . 705
Complications . . . 705
Postoperative Acute Pancreatitis . . . 705
Duodenal Leak and Fistula . . . 705
Intraoperative and Postoperative Hemorrhage . . . 706
References . . . 706

92 Choledochoduodenostomy: Surgical Legacy Technique . . . 707
Carol E. H. Scott-Conner
Indications . . . 707
Contraindications . . . 707
Preoperative Preparation . . . 707
Pitfalls and Danger Points . . . 707
Operative Strategy . . . 707
Size of Anastomotic Stoma . . . 707
Location of the Anastomosis . . . 707
Preventing the Sump Syndrome . . . 708
Documentation Basics . . . 708
Operative Technique . . . 708
Incision . . . 708
Choledochoduodenal Anastomosis . . . 708
Alternative Method of Anastomosis . . . 709
Drainage and Closure . . . 710
Postoperative Care . . . 711
Complications . . . 711
Further Reading . . . 711

93 Transduodenal Diverticulectomy . . . 713
Carol E. H. Scott-Conner
Indications . . . 713
Preoperative Preparation . . . 713
Pitfalls and Danger Points . . . 713
Operative Strategy . . . 713
Documentation Basics . . . 713
Operative Technique . . . 713

Incision . . . 713
Kocher Maneuver . . . 714
Duodenotomy and Diverticulectomy . . . 714
Closure and Drainage . . . 714
Postoperative Care . . . 715
Complications . . . 715
Further Reading . . . 715

94 Hepatic Resection . . . 717
Wen-Liang Fang and Carlos U. Corvera
Indications . . . 717
Preoperative Preparation . . . 717
Pitfalls and Danger Points . . . 717
Operative Strategy . . . 717
Anatomic Basis for Liver Resection . . . 717
Extent of Resection . . . 718
Anatomic Liver Resections . . . 719
Principles of Safe Liver Resection . . . 719
Parenchymal Transection . . . 719
Vascular Control . . . 720
Preservation of Bile Ducts . . . 720
Operative Technique . . . 721
Incision and Exposure . . . 721
Wedge (Nonanatomic, Subsegmental, or Peripheral) Resection . . . 721
Anatomic Oriented Segmental Resections . . . 721
Resection of Segments 2 and 3 (Left Lobectomy/Left Lateral Sectionectomy) . . . 722
Anatomic Right Hepatectomy (Right Hepatic Lobectomy) . . . 723
Anatomic Left Hepatectomy (Left Hepatic Lobectomy) . . . 726
Laparoscopic Liver Surgery . . . 727
Indications . . . 727
Special Equipment . . . 727
Laparoscopic Left Lateral Sectionectomy . . . 729
Totally Laparoscopic Right Lobectomy . . . 730
Hand-Assisted Laparoscopic Right Hepatectomy . . . 732
Postoperative Care . . . 732
Complications . . . 733
Further Reading . . . 733

Part VIII Pancreas
Umut Sarpel

95 Concepts in Surgery of the Pancreas . . . 737
Divya Sood and Rebekah R. White
Surgical Anatomy . . . 737
Trauma . . . 737
Acute Pancreatitis . . . 737
Diagnosis . . . 738
Treatment . . . 738
Chronic Pancreatitis . . . 738
Diagnosis . . . 738
Treatment of Chronic Pancreatitis . . . 738
Choice of Operation . . . 739
Drainage Procedures . . . 739
Resection Procedures . . . 739
Nerve Ablation . . . 739

Adenocarcinoma of the Pancreas . . . 740
Diagnosis . . . 740
Imaging . . . 740
Determination of Resectability . . . 740
Local Invasion . . . 740
Distant Metastasis . . . 741
Treatment . . . 741
Operative Management . . . 741
Neoadjuvant Therapy . . . 741
Islet Cell Tumors . . . 742
Cystic Neoplasms of the Pancreas . . . 742
Complications of Pancreatic Surgery . . . 743
Further Reading . . . 743

96 Partial Pancreatoduodenectomy . . . 745
Joseph J. Kim, Umut Sarpel, and Daniel M. Labow
Indications . . . 745
Contraindications . . . 745
Preoperative Preparation . . . 745
Pitfalls and Danger Points . . . 745
Operative Strategy . . . 746
Assessment of Pathology to Determine Resectability . . . 746
Avoiding and Managing Intraoperative Hemorrhage . . . 746
Vascular Resections . . . 746
Avoiding and Managing Postoperative Hemorrhage . . . 746
Avoiding Leakage from the Pancreatojejunal Anastomosis . . . 747
Operative Technique . . . 747
Diagnostic Laparoscopy . . . 747
Incision and Exposure . . . 747
Kocherization of the Duodenum . . . 748
Dissection of Portal Vein and Superior Mesenteric Vein . . . 748
Cholecystectomy . . . 749
Dissection of the Porta Hepatis . . . 749
Antrectomy . . . 751
Dissection and Division of Proximal Jejunum . . . 752
Division of Pancreas . . . 752
Dissection of Uncinate Process . . . 753
Reconstruction Techniques . . . 754
Hepaticojejunal Anastomosis . . . 755
Pancreaticojejunal Anastomosis . . . 755
Pancreaticojejunal Anastomosis by Invagination . . . 758
Insertion of Drains . . . 758
Gastrojejunostomy . . . 758
Pylorus Preservation . . . 759
Operative Technique . . . 759
Closure . . . 760
Postoperative Care . . . 760
Complications . . . 760
Further Reading . . . 761

97 Total Pancreatoduodenectomy . . . 763
Yael Feferman and Umut Sarpel
Indications . . . 763
Benign Conditions . . . 763

Premalignant Conditions . . . 763
Malignant Conditions . . . 763
Contraindications . . . 763
Preoperative Preparation . . . 763
Operative Strategy . . . 763
Operative Technique . . . 764
Laparoscopic Exploration . . . 764
Incision . . . 764
Mobilization of Pancreatic Head, Determination of Resectability . . . 764
Cholecystectomy and Hilar Dissection . . . 764
Splenectomy . . . 765
Mobilizing the Distal Pancreas . . . 765
Antrectomy/Pylorus-Preserving Procedure . . . 766
Mobilizing the Duodenojejunal Junction . . . 766
Freeing the Uncinate Process . . . 767
Reconstruction . . . 767
Postoperative Care . . . 768
Complications . . . 768
Further Reading . . . 768

98 Distal (Left) Pancreatectomy . . . 769
Brendan P. Lovasik and David A. Kooby
Indications . . . 769
Operative Strategy . . . 769
Operative Technique . . . 769
Laparoscopic Distal Pancreatectomy . . . 769
Open Distal Pancreatectomy . . . 773
Borderline Resectable Neoplasms . . . 774
Radical Antegrade Pantreatico-Splenectomy . . . 774
Distal Pancreatectomy with Celiac Axis Resection (DP-CAR, Appleby) . . . 774
Robotic Distal Pancreatectomy . . . 775
Postoperative Care . . . 775
Complications . . . 776
Further Reading . . . 776

99 Operations for Pancreatic Pseudocyst . . . 777
Nicholas J. Zyromski
Operative Strategy . . . 777
Background/Natural History . . . 777
Operative Indications . . . 777
Preoperative Preparation and Perioperative Considerations . . . 779
Operative Strategy and Technique . . . 781
Cyst-Enterostomy . . . 781
Cystogastrostomy . . . 781
Roux-en-Y Cystojejunostomy . . . 782
Resection . . . 783
Pancreatic Head Resection . . . 783
External Drainage . . . 783
Postoperative Care . . . 783
Follow-Up . . . 783
Pearls . . . 783
Further Reading . . . 783

100 Pancreaticojejunostomy for Chronic Pancreatitis 785
Faik G. Uzunoglu and Jakob R. Izbicki
Indications 785
Preoperative Preparation 785
Pitfalls and Danger Points 785
Operative Strategy 785
Operative Technique 787
Exposure 787
Incising the Pancreatic Duct 788
Pancreatic Head Resection 790
V-Shape Resection of the Body and Tail 790
Roux-en-Y Reconstruction 790
Postoperative Care 791
Complications 791
Further Reading 791

Part IX Spleen
Umut Sarpel

101 Concepts in Splenic Surgery 795
Prashant Sinha and H. Leon Pachter
Splenectomy for Disease 795
Perioperative Evaluation 795
Autoimmune Thrombocytopenic Purpura 796
Recurrent Symptoms After Splenectomy for Hematologic Disease 796
Choice of Surgical Approach: Open Versus Laparoscopic Procedure 796
Technical Considerations for Safe Laparoscopic Splenectomy 797
Laparoscopic Management of Splenic Cysts 797
Splenic Trauma 797
Nonoperative Splenic Salvage 798
Nonoperative Management of Splenic Trauma 798
Prognostic Indicators of Failure of Nonoperative Management 798
Follow-Up Imaging 798
Laparoscopy for the Management of Splenic Trauma 800
References 800

102 Open Splenectomy for Disease 803
Carl Winkler and Umut Sarpel
Indications 803
Preoperative Preparation 803
Pitfalls and Danger Points 803
Operative Strategy 803
Choice of Approach: Open or Laparoscopic? 803
Avoiding Intraoperative Hemorrhage 803
Preventing Postoperative Hemorrhage 804
Avoiding Pancreatic Injury 804
Avoiding Trauma to the Stomach 804
Preventing Postoperative Sepsis 804
Accessory Spleen 804
Operative Technique 804
Incision 804
Ligating the Splenic Artery 804

Exposing the Spleen . . . 805
Mobilizing the Spleen . . . 805
Ligating the Splenic Vessels . . . 805
Achieving Hemostasis and Searching for Accessory Spleens . . . 806
Imbricating the Greater Curvature of Stomach . . . 806
Abdominal Closure . . . 806
Postoperative Care . . . 807
Complications . . . 807
Further Reading . . . 807

103 Operations for Splenic Trauma . . . 809
Carina Biggs
Indications . . . 809
Preparation . . . 809
Pitfalls . . . 809
Operative Strategy . . . 809
Decision for Splenectomy or Repair of Spleen . . . 809
Operative Technique . . . 809
Exposure for Splenectomy . . . 810
Mobilization of the Spleen . . . 810
Temporary Control of Hemorrhage . . . 810
Identification of the Splenic Injury . . . 811
Removal of the Spleen . . . 811
Techniques for Splenic Preservation . . . 811
Iatrogenic Injuries . . . 812
Abdominal Closure . . . 812
Postoperative Care . . . 812
Further Reading . . . 813

104 Laparoscopic Splenectomy . . . 815
Manish Parikh and H. Leon Pachter
Indications . . . 815
Preoperative Evaluation and Preparation . . . 815
Pitfalls and Danger Points . . . 815
Operative Strategy . . . 816
Operative Technique . . . 816
Special Consideration: Splenomegaly (>11 cm) . . . 817
Laparoscopic Management of Splenic Cysts . . . 819
Postoperative Care . . . 820
Complications . . . 820
Further Reading . . . 821

Part X Hernia Repairs, Operations for Necrotizing Faciitis, Drainage of Subphrenic Abscess
Carol E. H. Scott-Conner

105 Concepts in Hernia Repair, Surgery for Necrotizing Fasciitis, and Drainage of Subphrenic Abscess . . . 825
Mark C. Horattas and Ileana K. Horattas
Patient Selection . . . 825
Selection of Anesthesia . . . 826
Perioperative Antibiotics . . . 826
Groin Hernia Repair . . . 826
Primary Repair . . . 827

Prosthetic Mesh Repair . . . 827
Laparoscopic Technique . . . 827
Repair of Femoral Hernia . . . 828
Repair of Recurrent Inguinal Hernia . . . 828
Repair of Large Ventral Hernias . . . 828
Necrotizing Fasciitis . . . 829
Subphrenic Abscess . . . 829
References . . . 829

106 Shouldice Repair of Inguinal Hernia . . . 831
Evgeny V. Arshava and Michael Alexander
Indications . . . 831
Preoperative Preparation . . . 831
Pitfalls and Danger Points . . . 831
Documentation . . . 831
Operative Strategy . . . 832
Anesthesia . . . 832
Dissection . . . 832
Reconstruction . . . 833
Operative Technique . . . 833
Local Anesthesia and Incision . . . 833
Dissection . . . 835
Inguinal Repair . . . 836
The First Line of the Repair . . . 836
The Second Line of the Repair . . . 839
The Third and Fourth Lines of Repair . . . 840
Complete Groin Repair Technique for Femoral Hernia . . . 841
Closure of Superficial Layers . . . 842
Postoperative Care . . . 842
Avoiding Postoperative Complications . . . 843
Infection . . . 843
Hemorrhage . . . 843
Testicular Atrophy and Hydrocele . . . 843
Injury to Bladder and Bowel . . . 843
Chronic Postoperative Pain . . . 843
Ejaculatory Dysfunction (Dysejaculation) . . . 844
Urinary Retention . . . 844
Hernia Recurrence . . . 844
Further Reading . . . 844

107 Cooper's Ligament (McVay) Repair of Inguinal Hernia . . . 845
Carol E. H. Scott-Conner
Indications . . . 845
Operative Strategy . . . 845
Documentation Basics . . . 845
Operative Technique . . . 845
Incision and Exposure . . . 845
Making the Relaxing Incision . . . 846
Inserting Cooper's Ligament Sutures . . . 846
Closing the External Oblique Aponeurosis . . . 847
Postoperative Care . . . 847
Complications . . . 847
Further Reading . . . 848

108 Mesh Repair of Inguinal Hernia 849
Carol E. H. Scott-Conner
Indications 849
Preoperative Preparation 849
Pitfalls and Danger Points 849
Operative Strategy 849
Documentation Basics 849
Operative Technique 849
Incision 849
Dissection and Identification of Direct and Indirect Sacs 849
Placement of Patch 850
Closure 851
Postoperative Care 851
Complications 851
Further Reading 851

109 Laparoscopic Inguinal Hernia Repair: Transabdominal Preperitoneal (TAPP) and Totally Extraperitoneal (TEP) Repairs 853
Muhammed Ashraf Memon and Robert J. Fitzgibbons Jr
Indications 853
Preoperative Preparation 853
Pitfalls and Danger Points 853
Operative Strategy 853
Operative Technique 854
Patient Position and Room Setup: TAPP or TEP 854
TAPP Approach 854
Placement of Mesh 856
Peritoneal Closure 856
Bilateral Hernias 856
TEP Approach 857
Complications 857
Vascular Injuries 857
Urinary Retention, Urinary Infection, Hematuria 857
Bladder Injury 858
Nerve Injury 858
Vas Deferens and Testicular Complications 858
Complications Related to the Mesh 858
Recurrence of the Hernia 858
Osteitis 859
Wound Infection 859
Further Reading 859

110 Operations for Recurrent Inguinal Hernia 861
Kent C. Choi and Carol E. H. Scott-Conner
Indications 861
Preoperative Preparation 861
Pitfalls and Danger Points 861
Documentation 861
Operative (Management) Strategy 861
Internal Ring Left Too Wide 862
Inadequate Reconstruction of the Inguinal Floor 862
Defect at Pubic Tubercle 862
Failure to Suture Transversalis Fascia or Transversus Arch 862
Failure to Excise Sac 862

Use of Absorbable Sutures . . . 862
Subcutaneous Transplantation of Cord . . . 862
Femoral Recurrence Following Inguinal Hernia Repair . . . 862
Infection . . . 863
Recurrent Indirect and Direct Inguinal Hernia . . . 863
Choice of Approach . . . 863
Anesthesia . . . 863
Selecting the Optimal Technique for Repair of Recurrent Inguinal Hernia . . . 863
Technique of Dissection . . . 863
Avoiding Testicular Complications . . . 864
Operative Technique . . . 864
Inguinal Approach . . . 864
Incision and Exposure . . . 864
Repairing Recurrent Hernia Following Previous Halsted Operation Without Opening the Inguinal Canal . . . 864
Dissecting the Inguinal Canal . . . 865
Repairing a Localized Defect in the Inguinal Floor . . . 865
Prosthetic Mesh Repair . . . 865
Abandoning the Anterior Approach . . . 865
Preperitoneal Approach Using Mesh Prosthesis (Surgical Legacy Technique) . . . 866
Incision and Exposure . . . 866
Suturing the Mesh . . . 866
Closing the Abdominal Incision . . . 867
Postoperative Care . . . 867
Complications . . . 867
References . . . 867

111 Femoral Hernia Repair . . . 869
Patrick W. McGonagill, Kent C. Choi, and Carol E. H. Scott-Conner
Indications . . . 869
Preoperative Preparation . . . 869
Pitfalls and Danger Points . . . 869
Operative Strategy . . . 869
Inguinal Approach . . . 869
Low Groin Approach . . . 869
Preperitoneal Approach . . . 870
Documentation Basics . . . 870
Operative Technique . . . 870
Low Groin Approach for Left Femoral Hernia . . . 870
Low Groin Approach Using Prosthetic Mesh "Plug" . . . 872
Preperitoneal Approach for Right Femoral Hernia (Nyhus) . . . 872
Anesthesia . . . 872
Incision . . . 872
Mobilizing the Hernial Sac . . . 873
Suturing the Hernial Ring . . . 873
Postoperative Care . . . 874
Complications . . . 874
Further Reading . . . 874

112 Operations for Large Ventral Hernia . . . 875
Ariel P. Santos
Indications . . . 875
Preoperative Preparation . . . 875
Pitfalls and Danger Points . . . 875

Operative Strategy . . . 875
Avoiding Postoperative Complications . . . 876
Infection . . . 876
Occult Wound Dehiscence . . . 876
Large Drain Exit Site at the Fascia . . . 876
Failure to Close Laparoscopic Trocar Sites Adequately . . . 876
Transverse Versus Vertical Incision . . . 876
Suturing Technique . . . 876
Type of Suture Material . . . 876
Size of Tissue Bites . . . 877
Suture Tension . . . 877
Intercurrent Disease . . . 877
Tissue Integrity . . . 878
Tension During Repair . . . 878
Role of Prosthetic Mesh . . . 878
Types of Synthetic Prosthetic Material . . . 878
Biologic Mesh (Biomesh) . . . 880
Myocutaneous Flap . . . 880
Separation of Components . . . 880
Use of Drains . . . 880
Operative Technique . . . 880
Elective Ventral Hernia Repair . . . 880
Dissecting the Hernial Sac . . . 880
Resecting the Hernial Sac . . . 882
Mesh Repair of Ventral Hernia . . . 882
Sandwich Repair . . . 883
Onlay Patch Mesh Repair . . . 883
Postoperative Care . . . 884
Complications . . . 884
Further Reading . . . 885

113 Laparoscopic Ventral Hernia Repair . . . 887
Peter Nau
Indications . . . 887
Preoperative Preparation . . . 887
Pitfalls and Danger Points . . . 888
Operative Technique . . . 888
Patient Positioning and Preparation of the Defect . . . 888
Sizing the Mesh . . . 889
Management of the Fascial Defect . . . 890
Postoperative Care . . . 892
Complications . . . 892
References . . . 892

114 Operations for Infected Abdominal Wound Dehiscence, Necrotizing Fasciitis, and Intraabdominal Abscesses . . . 893
Ariel P. Santos
Indications . . . 893
Preoperative Preparation . . . 893
Pitfalls and Danger Points . . . 893
Operative Strategy: Infected Abdominal Wall and Dehiscence . . . 893
Local Exploration . . . 894
Wide Debridement . . . 894
Managing the Abdominal Wall Defect . . . 894

Repeat Laparotomy for Recurrence of Abdominal Sepsis . . . 895
Management of Intestinal Stomas and Fistulas . . . 896
Marsupialization and Open Abdomen Management . . . 896
Intraabdominal Abscesses . . . 896
Approaches to Abscess Drainage . . . 896
Percutaneous Drainage . . . 896
Lateral and Subcostal Extraperitoneal Approach . . . 898
Laparoscopy . . . 899
Laparotomy . . . 901
Extraserous Approach . . . 902
Operative Technique . . . 902
Extraserous Subcostal Drainage of Right Subphrenic Abscess (Surgical Legacy Technique) . . . 902
Incision and Exposure . . . 902
Drainage and Closure . . . 902
Laparotomy for Subphrenic and Abdominal Abscesses . . . 902
Incision and Exposure . . . 902
Drainage and Closure . . . 903
Postoperative Care . . . 903
Postoperative Care After Abscess Drainage . . . 904
Further Reading . . . 904

Part XI Breast and Melanoma
Sonia L. Sugg

115 Concepts in Breast Surgery . . . 907
Sonia L. Sugg, Sophia L. Fu, and Carol E. H. Scott-Conner
Introduction . . . 907
Breast Cancer . . . 907
Epidemiology . . . 907
Breast Cancer Risk . . . 907
Breast Cancer Screening . . . 907
Imaging Modalities . . . 908
Breast Biopsy: Obtaining a Tissue Diagnosis . . . 908
Management of Common Benign Breast Lesions . . . 908
Nipple Discharge . . . 908
Breast Abscess . . . 909
Benign Breast Mass or Cyst . . . 909
Breast Lesions on CNB That May Require Excision . . . 909
Breast Malignant Diseases . . . 910
Ductal Carcinoma In Situ (DCIS) . . . 910
Paget's Disease of the Breast . . . 911
Invasive Breast Cancer . . . 911
Inflammatory Breast Cancer . . . 912
Surgical Treatment of Breast Cancer . . . 912
Considerations Prior to Surgery . . . 912
Is the Patient a Surgical Candidate? . . . 912
Is the Patient a Candidate for Breast Conservation? . . . 912
Surgery First or Neoadjuvant Treatment Followed by Surgery? . . . 912
Is the Patient a Candidate for Omitting SLN Biopsy? . . . 913
Will the Patient Require Postmastectomy Radiation? . . . 913
Are There Indications for Genetic Counseling? . . . 913
The Role of Shared Decision-Making . . . 913
Surgical Treatment of the Breast . . . 913

Breast Conservation Therapy (BCT) . . . 913
Mastectomy . . . 914
Lymph Node Surgery . . . 915
Adjuvant Systemic Therapy . . . 916
Treatment of Local Recurrence . . . 916
Metastatic Disease . . . 917
Breast Problems in Men . . . 917
References . . . 917

116 Excision of Benign Palpable Breast Mass . . . 921
Carol E. H. Scott-Conner
Indications . . . 921
Preoperative Preparation . . . 921
Operative Strategy . . . 921
Operative Technique . . . 922
Choice of Incision . . . 922
Local Anesthesia . . . 922
Dissection . . . 922
Repair . . . 923
Postoperative Care . . . 923
Complications . . . 924
Further Reading . . . 924

117 Excision of Ducts, Operations for Breast Abscess . . . 925
Emily L. Albright
Excision of Ducts . . . 925
Indications . . . 925
Preoperative Preparation . . . 925
Physical Examination . . . 925
Ductography . . . 925
Ductal Endoscopy . . . 925
Operations for Breast Abscess . . . 925
Indications . . . 925
Preoperative Preparation . . . 925
Documentation . . . 925
Operative Strategy . . . 926
Single Duct Excision Versus Total Duct Excision . . . 926
Strategic Approach to Breast Abscesses . . . 926
Avoiding Postoperative Complications . . . 926
Prevention of Skin Necrosis with Ductal Excision . . . 926
Operative Technique . . . 926
Single Duct Excision . . . 926
Incision . . . 926
Identification and Excision . . . 926
Closure . . . 926
Total Duct Excision . . . 927
Incision . . . 927
Excising the Ductal System . . . 927
Reconstruction . . . 927
Simple Breast Abscess . . . 929
Recurring Subareolar Abscess/Lactiferous Duct Fistula . . . 929
Postoperative Care . . . 930
Complications . . . 930
Further Reading . . . 930

118 Lumpectomy for Breast Cancer . . . 931
Ingrid Lizarraga
Indications . . . 931
Preoperative Preparation . . . 931
Pitfalls and Danger Points . . . 931
Documentation . . . 931
Operative Strategy . . . 931
Localization . . . 931
Incision . . . 932
Extent of Excision, Orienting the Specimen and Additional Margins . . . 932
Closure . . . 933
Special Techniques . . . 933
Intraoperative Radiation Therapy . . . 933
Oncoplastic Lumpectomy . . . 933
Avoiding Postoperative Complications . . . 933
Operative Technique . . . 933
Basic Lumpectomy . . . 933
Techniques for Localization . . . 934
Palpation-Guided Lumpectomy . . . 934
Wire-Localized Lumpectomy . . . 934
Ultrasound-Guided Lumpectomy . . . 935
Lumpectomy Using Implanted Localization Marker . . . 935
Postoperative Care . . . 936
Complications . . . 936
Further Reading . . . 936

119 Mastectomy: Simple (Total), Modified, and Classical Radical . . . 937
Carol E. H. Scott-Conner
Indications . . . 937
Preoperative Preparation . . . 937
Pitfalls and Danger Points . . . 938
Operative Strategy . . . 938
Sequencing the Operation . . . 938
Simple Versus Modified Radical Mastectomy . . . 938
Modified Radical Mastectomy . . . 938
Radical Mastectomy . . . 938
Incision and Skin Flaps . . . 939
Thickness of Skin Flap . . . 939
Alternative Incisions for Mastectomy . . . 939
Avoiding Dog Ears . . . 940
Axillary Lymph Node Anatomy for Breast Surgeons . . . 940
Documentation Basics . . . 940
Operative Technique . . . 940
Clearing the Pectoral Fascia . . . 942
Axillary Dissection: Unroofing the Axillary Vein . . . 942
Axillary Vein Dissection . . . 943
Radical Mastectomy . . . 944
Irrigation and Closure . . . 945
Postoperative Care . . . 945
Postoperative Complications . . . 946
Ischemia of Skin Flap . . . 946
Wound Infection . . . 946
Seromas . . . 946
Lymphedema . . . 946
Further Reading . . . 946

120 Skin and Nipple Sparing Mastectomy 947
Sonia L. Sugg, Cynthia Lee, and Iryna Chesnokova
Indications 947
Preoperative Preparation 947
Pitfalls and Danger Points 947
Operative Strategy 947
Skin Sparing Versus Nipple Sparing Mastectomy 947
Axillary Lymph Nodes 948
Extent of Mastectomy 948
Incision and Skin Flaps 949
Skin Flap Techniques 949
Visualization 949
Incisions 950
Documentation Basics 951
Operative Technique 951
Develop the Skin Flaps (Anterior) 951
Skin Sparing Mastectomy 951
Nipple Sparing Mastectomy 952
Release the Breast from the Chest Wall (Posterior) 952
Finishing the Mastectomy 953
Postoperative Care 953
Postoperative Complications 953
Ischemia of Skin Flap 953
Ischemia of Nipple 953
Wound Infection 954
Further Reading 954

121 Sentinel Lymph Node Biopsy and Axillary Staging for Breast Cancer 955
Lillian Erdahl and Carol E. H. Scott-Conner
Indications 955
Contraindications 955
Preoperative Preparation 955
Operative Strategy 955
Sentinel Lymph Node Biopsy 955
Axillary Node Dissection 957
Targeted Axillary Dissection 957
Axillary Reverse Mapping 958
Pitfalls and Danger Points 958
Documentation Basics 958
Operative Technique 958
Sentinel Lymph Node Biopsy 958
Axillary Node Dissection 960
Postoperative Care 961
Complications 962
Further Reading 962

122 Concepts in Melanoma 963
Leah Kathryn Winer and Jeffrey J. Sussman
Introduction 963
Diagnosis 963
Risk Factors 963
Biopsy 963
Staging 964
Primary Lesion: Wide Local Excision (WLE) 964

Management of the Regional Lymph Nodes . . . 964
Sentinel Lymph Node Biopsy . . . 964
Adjuvant Therapy . . . 966
In-Transit Melanoma . . . 966
Metastatic Disease . . . 967
References . . . 967

123 Wide Local Excision and Sentinel Lymph Node Biopsy for Melanoma . . . 969
Carlos H. F. Chan and Hisakazu Hoshi
Indications . . . 969
Wide Local Excision . . . 969
Sentinel Lymph Node Biopsy . . . 969
Contraindications . . . 969
Preoperative Preparation . . . 970
Pitfalls and Danger Points . . . 970
Operative Strategy . . . 970
Biopsy . . . 970
Wide Local Excision . . . 970
Sentinel Lymph Node Biopsy . . . 971
Documentation Basics . . . 972
Operative Technique . . . 972
Wide Local Excision . . . 972
Sentinel Lymph Node Biopsy . . . 973
Postoperative Care . . . 974
Complications . . . 974
Further Reading . . . 974

124 Axillary Lymphadenectomy for Melanoma . . . 975
J. E. Maxwell and Sonia L. Sugg
Indications . . . 975
Preoperative Preparation . . . 975
Pitfalls and Danger Points . . . 975
Documentation . . . 975
Operative Strategy . . . 975
Operative Technique . . . 975
Incision . . . 975
Exposing the Axillary Contents . . . 976
Clearing the Axillary Vein . . . 976
Dissecting the Chest Wall . . . 977
Subscapular Space . . . 977
Drainage and Closure . . . 977
Postoperative Care . . . 977
Complications . . . 978
Further Reading . . . 978

125 Superficial and Deep Groin (Femoroinguinal and Pelvic) Dissection . . . 979
Hisakazu Hoshi
Indications . . . 979
Preoperative Evaluation . . . 979
Pitfalls and Danger Points . . . 979
Documentation . . . 979
Operative Strategy . . . 979
Preventing Wound Infection and Wound Dehiscence . . . 979
Reducing Incidence of Lymphedema . . . 980

Indications for Deep Groin Dissection and Exposure. 980
Adequacy of Nodal Dissection 980
Operative Technique 981
Incision and Exposure. 981
Dissection in the Femoral Triangle. 981
Supra Inguinal Ligament Dissection. 981
Deep Groin (Pelvic) Dissection 981
Sartorius Muscular Flap 983
Skin Closure and Drainage 983
Postoperative Care 983
Complications 983
Further Reading 983

Part XII Thyroid, Parathyroid, and Adrenal, Parotidectomy, and Tracheal Procedures
Sonia L. Sugg

126 Concepts in Thyroid, Parathyroid, and Adrenal Surgery 987
Janice L. Pasieka
Thyroid 987
Benign Thyroid Disease 987
Hyperthyroidism 987
Multinodular Goiter 988
Thyroid Carcinoma 989
Ultrasound, Fine-Needle Aspiration, and Molecular Testing 989
Surgical Treatment of Thyroid Cancer 989
Well-Differentiated Thyroid Cancer 989
Medullary Thyroid Cancer 990
Parathyroid 990
Primary Hyperparathyroidism 991
Secondary and Tertiary Hyperparathyroidism 991
Parathyroidectomy 992
Adrenal 992
Adrenal Incidentalomas 993
Primary Aldosteronism 993
Cushing's Syndrome 994
Pheochromocytoma/Paraganglioma 994
Surgical Approaches to the Adrenal Gland. 994
Further Reading 994

127 Thyroidectomy 997
Geeta Lal
Indications. 997
Preoperative Preparation 997
Pitfalls and Danger Points. 997
Documentation 997
Operative Strategy. 997
Preserving the Superior Laryngeal Nerve. 997
Identification and Preservation of Recurrent Laryngeal Nerve. 998
Preserving Parathyroid Glands 999
Operative Technique 999
Intraoperative Preparation. 999
Incision and Exposure. 999
Identification and Ligation of the Isthmus and Middle Thyroid Vein. 1000

Dissecting the Superior Pole and Superior Parathyroid Gland . . . 1000
Identification of Inferior Pole Vessels . . . 1001
Identification of the Recurrent Laryngeal Nerve and Inferior Parathyroid Gland . . . 1001
Reimplantation of Parathyroid Glands . . . 1002
Subtotal Thyroid Lobectomy . . . 1002
Total Thyroid Lobectomy . . . 1002
Partial Thyroid Lobectomy . . . 1002
Closure . . . 1003
Postoperative Care . . . 1003
Complications . . . 1004
Minimally Invasive Thyroidectomy . . . 1005
Further Reading . . . 1005

128 Neck Dissection for Thyroid Cancer . . . 1007
Maheshwaran Sivarajah and Rebecca S. Sippel
Indications . . . 1007
Preoperative Preparation . . . 1007
Pitfalls and Danger Points . . . 1008
Scarring Due to Prior Surgery . . . 1008
Nerve Injuries . . . 1008
Injury to the Thoracic Duct . . . 1008
Seroma . . . 1008
Documentation . . . 1008
Operative Strategy . . . 1009
Operative Technique . . . 1009
Central Compartment Neck Dissection . . . 1010
Lateral Compartment Neck Dissection . . . 1011
Avoiding Postoperative Complications . . . 1012
Postoperative Care . . . 1013
Complications . . . 1013
Further Reading . . . 1013

129 Parathyroidectomy . . . 1015
Sonia L. Sugg
Indications . . . 1015
Preoperative Preparation . . . 1015
Pitfalls and Danger Points . . . 1016
Operative Strategy . . . 1016
Curing the Disease . . . 1016
Preserving the Recurrent Laryngeal Nerve . . . 1016
Preserving the Superior Laryngeal Nerve . . . 1017
Preserving Normal Parathyroid Tissue . . . 1017
Operative Technique . . . 1017
Incision and Exposure . . . 1017
Identify Crossing of the Inferior Thyroid Artery and the Recurrent Laryngeal Nerve . . . 1017
Identifying Inferior and Superior Parathyroids . . . 1018
Resecting the Adenoma . . . 1018
Biopsying Normal Parathyroid . . . 1018
Subtotal Parathyroidectomy . . . 1018
Total Parathyroidectomy with Autotransplantation . . . 1018
Sequence for an Unfound Parathyroid Gland . . . 1018
Closure . . . 1019

Reoperation . . . 1019
Posterior Approach . . . 1019
Postoperative Care . . . 1019
Complications . . . 1020
References . . . 1020

130 Minimally Invasive Parathyroidectomy . . . 1021
Philip M. Spanheimer and Sonia L. Sugg
Indications and Preoperative Preparation . . . 1021
Pitfalls and Danger Points . . . 1021
Documentation . . . 1021
Operative Strategy . . . 1022
Intraoperative PTH Monitoring (IOPTH) . . . 1022
Avoiding Postoperative Complications . . . 1022
Preserving the Recurrent Laryngeal Nerve . . . 1022
Operative Technique . . . 1022
Incision and Exposure . . . 1022
Postoperative Care . . . 1023
Complications . . . 1023
References . . . 1024

131 Open Adrenalectomy . . . 1025
James R. Howe
Indications . . . 1025
Preoperative Preparation . . . 1025
Pitfalls and Danger Points . . . 1026
Documentation . . . 1027
Operative Strategy . . . 1027
Operative Technique: Right Adrenalectomy . . . 1027
Left Adrenalectomy . . . 1029
Postoperative Care . . . 1030
Complications . . . 1031
Further Reading . . . 1031

132 Laparoscopic Adrenalectomy . . . 1033
Emily E. K. Murphy and Tracy S. Wang
Indications . . . 1033
Relative Contraindications . . . 1033
Preoperative Preparation . . . 1033
Special Considerations . . . 1033
Pitfalls and Danger Points . . . 1034
Preoperative . . . 1034
Intraoperative . . . 1034
Postoperative . . . 1034
Documentation . . . 1034
Operative Strategy . . . 1034
Avoiding Postoperative Complications . . . 1035
Operative Technique . . . 1035
Transabdominal Approach . . . 1035
Retroperitoneoscopic Approach . . . 1037
Special Circumstances . . . 1038
Postoperative Care . . . 1038
Complications . . . 1039
Further Reading . . . 1039

133 Parotidectomy . . . 1041
Carol E. H. Scott-Conner
Indications . . . 1041
Pitfalls and Danger Points . . . 1041
Operative Strategy . . . 1041
Extent of Resection . . . 1041
Locating and Preserving the Facial Nerve . . . 1041
Documentation Basics . . . 1042
Operative Technique . . . 1042
Incision and Exposure . . . 1042
Exposing the Posterior Margin of the Parotid Gland . . . 1043
Locating the Facial Nerve . . . 1043
Dissecting Facial Nerve Branches . . . 1044
Removing Deep Lobe of Parotid Gland (When Indicated) . . . 1044
Drainage and Closure . . . 1045
Postoperative Care . . . 1045
Complications . . . 1045
Further Reading . . . 1045

134 Cricothyroidotomy . . . 1047
Jennifer Shanklin and Kathleen Romanowski
Indication . . . 1047
Preoperative Preparation . . . 1047
Pitfalls and Danger Points . . . 1047
Operative Strategy . . . 1047
Documentation Basics . . . 1048
Operative Technique . . . 1048
Postoperative Care . . . 1049
Complications . . . 1049
References . . . 1049

135 Tracheostomy . . . 1051
Carol E. H. Scott-Conner and K. Shad Pharaon
Indications . . . 1051
Preoperative Preparation . . . 1051
Pitfalls and Danger Points . . . 1051
Introduction . . . 1051
Operative Strategy . . . 1052
Documentation Basics . . . 1052
Operative Technique: Formal Tracheostomy . . . 1052
Endotracheal Tube . . . 1052
Incision and Exposure . . . 1052
Identifying the Tracheal Rings . . . 1052
Checking the Tracheostomy Equipment . . . 1053
Opening the Trachea . . . 1053
Inserting the Tracheostomy Tube . . . 1054
Closure . . . 1054
Percutaneous Tracheostomy . . . 1054
Positioning and Setup . . . 1055
Procedure . . . 1055
Postoperative Care . . . 1057
Complications . . . 1057
Further Reading . . . 1058

Index . . . 1059