Reinhard Bittner · Ferdinand Köckerling Robert J. Fitzgibbons, Jr. · Karl A. LeBlanc Sumeet K. Mittal · Pradeep Chowbey *Editors*

Laparo-endoscopic Hernia Surgery

Evidence Based Clinical Practice



Laparo-endoscopic Hernia Surgery

Reinhard Bittner
Ferdinand Köckerling
Robert J. Fitzgibbons, Jr.
Karl A. LeBlanc
Sumeet K. Mittal
Pradeep Chowbey
Editors

Laparo-endoscopic Hernia Surgery

Evidence Based Clinical Practice



Editors

Reinhard Bittner

Em.Director of Surgical Department Marienhospital Stuttgart Stuttgart, Germany

Robert J. Fitzgibbons, Jr.

Department of General Surgery Creighton University School of Medicine Omaha, Nebraska, USA

Sumeet K. Mittal

Norton Thoracic Institute, Dignity Health Creighton University School of Medicine (Phoenix campus) Phoenix, Arizona, USA

Ferdinand Köckerling

Academic Teaching Hospital of Charitè Medical School, Vivantes Hospital Department of Surgery and Center for Minimally Invasive Surgery Berlin, Germany

Karl A. LeBlanc

Louisiana State University School of Medicine, Department of Surgery Our Lady of the Lake Physician Group, Department of Surgery Baton Rouge, Louisiana, USA

Pradeep Chowbey

Minimal Access, Metabolic and Bariatric Surgery Max Super Specialty Hospital Saket New Delhi, India

ISBN 978-3-662-55491-3 ISBN 978-3-662-55493-7 (eBook) https://doi.org/10.1007/978-3-662-55493-7

Library of Congress Control Number: 2018938554

© Springer-Verlag GmbH Germany, part of Springer Nature 2018

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, express 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.

Printed on acid-free paper

This Springer imprint is published by the registered company Springer-Verlag GmbH, DE part of Springer Nature

The registered company address is: Heidelberger Platz 3, 14197 Berlin, Germany

Preface

When asked by Dr. Bittner to join him as a coeditor of this work, I couldn't help but think "why do we need another book devoted to hernia repairs." But then he explained the unique perspective he intended as the focus of this new work. He felt there was a need for a book about hernia repair which was strictly limited to endoscopic surgery and was to incorporate guidelines indorsed by important surgical societies derived from critical analysis of appropriate literature. Certainly, traditional aspects of a surgical textbook were to be included in each chapter such as historical perspective, anatomy, incidence, operative details, perioperative care, and so on, but they are presented from an evidence-based perspective and not just the opinion of the author. I quickly came to the realization that he was right. I respectfully accepted the invitation and was honored to be asked.

Now after several years of work, the book has come to fruition. A quick perusal of the table of contents reveals an author list which can be considered a "who's who" in the field of endoscopic hernia surgery. Each chapter is well written and a pleasure to read. I believe the original goals of applying evidence-based science to the clinical practice of endoscopic hernia surgery have been met and even superseded.

Finally, it is important for the reader to recognize that the driving force behind this work was Dr. Reinhard Bittner. From the original conception to the actual production, it was he alone who kept the work going with endless letters, emails, phone calls and face-to-face conversations with authors encouraging them to complete their assignments. We all know that, in this day and age with so many other priorities, this can be a daunting task. Congratulations to Dr. Bittner because without him this work would have never been completed. I can't thank him enough for the small part he allowed me to contribute to the project.

Robert J. Fitzgibbons, Jr., MD, FACS Omaha, NE 68131, USA

Preface

In the era of digital media, does it still make sense to write a surgical textbook? The digital media provide the spread of the newest results of experimental and clinical research within seconds to every interested surgeon around the world. However, when using the digital media alone in order to study and to learn the well-proven standards in diagnostics, operative techniques and aftercare, especially in the new field of surgery, the laparo-endoscopic hernia repair, it is almost impossible to get the necessary information in a timely manner. On the other hand, while writing a book takes about 2-3 years, however, for the surgeon to look for the essentials in his daily work, it requires only a very short time to be fully informed. Therefore, despite currently overwhelming digitization, the printed media are still indispensable.

But, why write another book on hernia surgery as there are already many? This book is mainly devoted to laparo-endoscopic hernia surgery, but covers some particularly noteworthy features: (1) This textbook provides not only a comprehensive, state-of-the art review of the total field of laparo-endoscopic surgery of inguinal and ventral hernia but also of hiatal hernia repair. Furthermore, recently achieved insights into the surgical anatomy of the groin and the abdominal wall, in current operative techniques and mesh technology, are described in detail. (2) The uniqueness

of this book, however, is that not only the good clinical practice is described but also the scientific background of daily routine work is quoted in terms of evidence-based medicine (Oxford classification of levels of evidence). (3) This book is written by an international group (International Endohernia Society (IEHS)) of highly experienced laparo-endoscopic surgeons from three continents inclusive of former presidents and meeting presidents of the German Hernia Society (V. Schumpelick, R. Bittner, F. Köckerling, W. Reinpold, D. Weyhe, U. Dietz, A. Koch), the European Hernia Society (V. Schumpelick, R. H. Fortelny, S. Morales-Conde), the Americas Hernia Society (R. Fitzgibbons, K. A. LeBlanc, M. Arregui, B. Ramshaw), and the Asia-Pacific Hernia Society (P. Chowbey, D. Lomanto, A. Sharma).

In summary, hernia surgery affects about 20 million patients per year worldwide. Due to this huge number of patients, the quality of performances in diagnostics and treatment has an impact not only on the individual patient but also on the cost for the health care systems of the respective countries. Therefore, it is of paramount importance to find the best treatment options. This applies in particular to this new field of surgery, the laparo-endoscopic hernia repair. This book may be an indispensable aid to any surgeon in his daily decision-making process to do the best for his patient.

Reinhard Bittner Stuttgart, BW, Germany

Ferdinand Köckerling Berlin, Germany

Preface

Every surgeon strives for excellence to deliver best clinical outcomes. Surgery is the field of science which is in the process of continuous evolution and has gained momentum in the past few decades. Today, when we sit in a time machine, grab the control gears in our hand, and accelerate on the road of the twenty-fisrst century, the pursuit of herniology has taken a giant leap forward towards advanced surgical techniques that constitute minimal access surgery (MAS). Laparoscopic surgery has emerged as a cost-effective and patient-friendly technique for the repair of hernias.

The surgical doctrine of conventional hernia surgeries using large incisions, inconvenience of adjusting lights in the operation theaters, using magnifying loupes has revolutionized into small ports, magnified vision through laparoscopes, increased dexterity, easy access, shorter hospital stay, and faster recovery for the patients with minimal access surgeries.

Encountering the challenging situations on the operation table has increased the surgical expertise in laparoscopic hernia repairs. These academic records and literature are a medium to equip the young and upcoming surgeons to face and deal with the complex situations and to cater the needs of patients.

It gives me immense pleasure and honor to be a part of this academic venture. This book is an amalgamation of dynamic experiences and insights to laparoscopic hernia repairs. The team approach for the management of hernias with evidence-based clinical practice has been thoroughly discussed. The landmark of this published work is its comprehensive chapters which have been compiled in a precise way for each type of hernia for easy understanding and clarity. Clinical tips and surgical experience contributed by eminent herniologists across the globe are highly commendable. I would like to once again compliment the authors and the team for taking the opportunity under one platform to share their experiences and opening the new gateways for future laparoscopic surgeons.

Tracking the wheels of surgical journey from old standard approaches to modern and current approaches, the change is never ending. These changes have the potential to unfold newer understanding, newer approaches, and implementation of new prosthetic materials in the field of herniology.

I would just like to conclude that safety is never enough in the ever-evolving world. This manuscript is an attempt to increase the level of safety for the present generation of surgeons engaged in laparoscopic hernia repairs.

Pradeep Chowbey

Saket, New Delhi, India

Contents

L	Inguinal Hernia	
1	Clinical Anatomy of the Groin: Posterior Laparoscopic ApproachReinhard Bittner, David Chen, and Wolfgang Reinpold	5
2	Diagnostics of Inguinal Hernias	21
3	Classification of Inguinal Hernia Volker Schumpelick	27
4	Chain of Events Leading to the Development of the Current Techniques of Laparoscopic Inguinal Hernia Repair: The Time Was Ripe Maurice Arregui	31
5	Indication for Surgery: Open or Laparoendoscopic Techniques in Groin Hernias Jan F. Kukleta, Ferdinand Köckerling, and George Ferzli	37
6	Patient Selection for Laparoendoscopic Inguinal Hernia Repair Mazen Iskandar and George Ferzli	43
7	Watchful Waiting as a Treatment Strategy in Patients with Asymptomatic Inguinal Hernia Brian Biggerstaff, Shreya Shetty, and Robert J. Fitzgibbons, Jr.	51
8	Perioperative Management of Laparoscopic Inguinal Hernia Repair Henning Niebuhr, Bernd Stechemesser, and Reinhard Bittner	59
9	Transabdominal Preperitoneal Patch Plasty (TAPP): Standard Technique and Specific Risks Reinhard Bittner, Jan F. Kukleta, and David Chen	79
10	TAPP: Complications, Prevention, Education, and Preferences	101
11	Technique Total Extraperitoneal Patch Plasty (TEP): Standard Technique and Specific Risks Ferdinand Köckerling, Pradeep Chowbey, Davide Lomanto, and Maurice Arregui	119
12	Technique Total Extraperitoneal Patch Plasty (TEP): Complications, Prevention, Education, and Preferences Ferdinand Köckerling, Pradeep Chowbey, Davide Lomanto, and Maurice Arregui	141

13	Comparison TAPP vs. TEP: Which Technique Is Better?	. 151
	Virinder Kumar Bansal, Asuri Krishna, Nalinikant Ghosh,	
	Reinhard Bittner, and Mahesh C. Misra	
14	Complex Inguinal Hernias	. 171
	Mazen Iskandar and George Ferzli	
15	Mesh Technology at Inguinal Hernia Repair	. 183
	Ferdinand Köckerling, Dirk Weyhe, Rene H. Fortelny, and Bruce Ramshaw	
16	Aftercare and Recovery in Laparoscopic Inguinal Hernia Surgery	. 195
	Ralf M. Wilke, Andrew de Beaux, and Juliane Bingener-Casey	
17	Chronic Postoperative Inguinal Pain (CPIP)	. 201
	Wolfgang Reinpold and David Chen	
18	Costs	. 215
	G. H. van Ramshorst and Reinhard Bittner	
19	Sportsmen Hernia	. 225
	Salvador Morales-Conde, Moshe Dudai, and Andreas Koch	
20	Comparison to Open Techniques	. 235
	Baukje Van Den Heuvel, Robert J. Fitzgibbons, Jr., and Reinhard Bittner	
21	Reduced Port in Laparoendoscopic Inguinal Hernia Repair	. 243
	Davide Lomanto, Rajesh Khullar, Thomas Carus, and Sujith Wijerathne	
II	Ventral and Incisional Hernias	
22	Anatomy of the Abdominal Wall: What Is Important	
	for Laparoscopic Surgery?	. 253
	Romed Hörmann, Helga Fritsch, and Karl A. LeBlanc	
23	Ventral and Incisional Hernias: Differences and Indications	
	for Laparoscopic Surgery	. 261
	Ferdinand Köckerling and Anil Sharma	
24	Pathophysiology and Diagnostics of Ventral	267
	and Incisional Hernias	. 267
	Rudolf Schrittwieser	
25	Classification of Ventral and Incisional Hernias	. 273
	Ulrich A. Dietz and Juliane Bingener-Casey	
26	Perioperative Management of Ventral and Incisional Hernias	. 283
	Rudolf Schrittwieser	

27	Standard Technique Laparoscopic Repair of Ventral	
	and Incisional Hernia	287
	Karl A. LeBlanc, Anil Sharma, and Jan F. Kukleta	
28	Aftercare and Pain Management	305
	Juliane Bingener-Casey and Ralf M. Wilke	
29	Complications, Pitfalls and Prevention of Complications	
	of Laparoscopic Incisional and Ventral Hernia Repair	
	and Comparison to Open Repair	311
	Asuri Krishna, Virinder Kumar Bansal, and Mahesh C. Misra	
30	Education and Learning Curve in Ventral Hernia Repair	333
	Davide Lomanto and Sujith Wijerathne	
31	Complex Ventral and Incisional Hernias	339
	Ferdinand Köckerling, Davide Lomanto, and Pradeep Chowbey	
	· ,	
32	Ventral and Incisional Hernias Mesh Technology	349
	Ferdinand Köckerling and Bruce Ramshaw	
33	Incisional and Abdominal Wall Hernia Repair with Minimally	
	Invasive Extraperitoneal Synthetic Mesh Implantation Using	
	MILOS Technique (Mini and Less Open Sublay Surgery)	357
	Wolfgang Reinpold	
34	Endoscopic Mini/Less Open Sublay (EMILOS) Technique:	
	A Variation of the MILOS Operation in the Therapeutic	
	Spectrum of Primary and Secondary Ventral Hernias	365
	Reinhard Bittner and Jochen Schwarz	
35	Lumbar and Other Unusual Hernias	373
	Karl A. LeBlanc	
36	Single-Port Technique and Robotics in Ventral Hernia Repair	381
	Davide Lomanto and Sujith Wijerathne	
Ш	Hiatal Hernias	
37	General Issues of Hiatal Hernias	387
	Burkhard H. A. von Rahden, Sumeet K. Mittal, and Ellen Morrow	
38	Techniques of Hiatal Hernia Repair	393
	Beat Müller-Stich, Philip C. Müller, Rudoph Pointner, Stavros A. Antoniou,	
	Burkhard H. A. von Rahden, and Sumeet K. Mittal	
39	Mesh Technology in Hiatal Hernia	409
-	Ferdinand Köckerling, Beat Müller-Stich, and Bruce Ramshaw	

40	Complications of Hiatal Hernia Repair and Prevention Jelmer E. Oor, Ferdinand Köckerling, Rajesh Khullar, and Eric J. Hazebroek	415
41	Complex Hiatal Hernias Dirk Weyhe and Pradeep Chowbey	421
42	Hiatal Hernia Repair in Difficult Pathologic-Anatomic Situations at the Hiatus Pradeep Chowbey, Alice Chung, and Ellen Morrow	433
43	Comparisons of Methods at Hiatal Hernia Repair	439
44	New Technologies in Hiatal Hernia Repair: Robotics, Single Port	447
45	Education and Learning in Hiatal Hernia Repair	457
46	Anesthesiologic Aspects of Laparoscopic Hernia Repair	465
	Supplementary Information Index	477

Contributors

Stavros A. Antoniou

Department of General Surgery University Hospital of Heraklion Heraklion, 71 500, Greece stavros.antoniou@hotmail.com

Maurice Arregui

Department of Surgery St. Vincent Hospital Indianapolis, IN, USA mauricearregui@me.com arregui@ameritech.net

Virinder Kumar Bansal

Department of Surgical Disciplines All India Institute of Medical Sciences Delhi, New Delhi 110029, India drykbansal@gmail.com

Brian Biggerstaff

Department of Surgery Creighton University Medical Center 601 N 30th Street, Suite 3700 Omaha, NE68114, USA BrianBiggerstaff@creighton.edu

Juliane Bingener-Casey

Department of Surgery
Mayo Clinic College of Medicine and Science
Rochester, MN, USA
bingenercasey.juliane@mayo.edu

Reinhard Bittner

Em.Director of Surgical Department Marienhospital Stuttgart Stuttgart, Germany bittnerfamilie@web.de

Thomas Carus

Klinik für Allgemein-, Visceral- und Gefäßchirurgie Asklepios Westklinikum Hamburg Suurheid, Hamburg, Deutschland Thomas.Carus@Klinikum-Bremen-Ost.de

David Chen

Lichtenstein Amid Hernia Clinic at UCLA Section of Minimally Invasive Surgery UCLA Division of General Surgery Santa Monica, CA, USA DCChen@mednet.ucla.edu

Pradeep Chowbey

Minimal Access, Metabolic and Bariatric Surgery Max Super Specialty Hospital Saket Delhi, New Delhi, India pradeepchowbey@gmail.com

Alice Chung

Department of Surgery University of Utah Salt Lake City, UT, USA alice.yuo@gmail.com

Andrew de Beaux

Royal Infirmary of Edinburgh Edinburgh, UK adebeaux@doctors.org.uk

Ulrich A. Dietz

Department of Surgery
Kantonsspital Olten
Baselstrasse 150, Olten, Solothurn
CH-4600, Switzerland
ulrich.dietz@spital.so.ch
dietz_u@chirurgie.uni-wuerzburg.de

Moshe Dudai

Surgery, Hernia-Excellence Ramat Aviv Medical Center Tel Aviv 69101, Israel moshe.dudai@gmail.com

George Ferzli

Surgery, NYU Lutheran Medical Center Brooklyn, NY, USA doctorferzli@gmail.com

Robert J. Fitzgibbons, Jr.

Department of Surgery Creighton University Medical Center Omaha, NE, USA fitzjr@creighton.edu

Rene H. Fortelny

General, Visceral and Oncological Surgery Wilhelminenspital Vienna, Austria rene.fortelny@wienkav.at

Helga Fritsch

Anatomy, Histology and Embryology Division of Clinical and Functional Anatomy/ Medical University of Innsbruck Innsbruck, Austria helga.fritsch@i-med.ac.at

Nalinikant Ghosh

Department of Surgical Disciplines All India Institute of Medical Sciences New Delhi, Delhi, India ghoshnalinikanta@gmail.com

Claudia Hafner-Chvojka

Klinik für Anästhesiologie und operative Intensivmedizin, Schmerztherapie Marienhospital Stuttgart Stuttgart 70199, Germany claudia.hafner@vinzenz.de

Eric J. Hazebroek

Department of Surgery St. Antonius Hospital Nieuwegein, The Netherlands ehazebroek@rijnstate.nl

Romed Hörmann

Anatomy, Histology and Embryology
Division of Clinical and Functional Anatomy/
Medical University of Innsbruck
Innsbruck, Austria
romed.hoermann@i-med.ac.at

Mazen Iskandar

Surgery, Mount Sinai Beth Israel New York, NY 10003, USA MazenElia.iskandar@mountsinai.org

Wilfried Junginger

Zollernstrasse 5 Tübingen 72074, Germany wilfried.junginger@web.de

Rajesh Khullar

Max Institute of Minimal Access, Metabolic & Bariatric Surgery Max Super Speciality Hospital Saket, New Delhi, India rajesh.khullar@maxhealthcare.com

Andreas Koch

Day Surgery and Hernia Center Gerhart-Hauptmann-Str.15 Cottbus 03042, Germany akchirurg@aol.com

Ferdinand Köckerling

Department of General Surgery and Center for Minimally Invasive Surgery Vivantes Hospital Spandau Berlin, Germany ferdinand.koeckerling@vivantes.de

Asuri Krishna

Department of Surgical Disciplines All India Institute of Medical Sciences Delhi, New Delhi 110029, India dr.asurikrishna@gmail.com

Jan F. Kukleta

Klinik Im Park Zurich (Hirslanden Group) Visceral Surgery, NetworkHernia Zurich Switzerland jfkukleta@bluewin.ch

Karl A. LeBlanc

Surgery, Our Lady of the Lake Physician Group and Louisiana State University School of Medicine, Baton Rouge, LA, USA Karl.LeBlanc@ololrmc.com

Davide Lomanto

Minimally Invasive Surgical Centre Department of Surgery National University Hospital Singapore 119074, Singapore surdl@nus.edu.sg

Mahesh C. Misra

General and Minimally Invasive Surgery, Surgical Disciplines Mahatma Gandhi University of Medical Sciences & Technology Jaipur, Rajasthan, India mcmisra@gmail.com

Sumeet K. Mittal

Norton Thoracic Institute, Dignity Health, Creighton University School of Medicine (Phoenix Campus) Phoenix, AZ, USA SumeetMittal@creighton.edu

Salvador Morales-Conde

Unit of Innovation in Minimally Invasive Surgery, Department of General and Digestive Surgery University Hospital "Virgen del Rocío" Sevilla 41010, Spain smoralesc@gmail.com

Ellen Morrow

Department of Surgery University of Utah Salt Lake City, UT, USA ellenhmorrow@gmail.com

Philip C. Müller

Department of General, Visceral and Transplantation Surgery University Hospital Heidelberg Heidelberg, Germany philip.mueller@hotmail.com

Beat Müller-Stich

Department of General Surgery Heidelberg University Hospital Heidelberg 69120, Germany beat.mueller@med.uni-heidelberg.de

Henning Niebuhr

Hernia Surgery
Hanse-Hernienzentrum Hamburg
Hamburg 21031, Germany
dr.niebuhr@t-online.de

Jelmer E. Oor

Department of Surgery St. Antonius Hospital Nieuwegein, The Netherlands j.oor@antoniusziekenhuis.nl

Rudoph Pointner

Tauernklinikum GmbH Stefan-Zweig-Straße Zell am See, Austria rudolph.pointner@tauernklinikum.at

Bruce Ramshaw

Department of Surgery University Surgeons Associates Knoxville, TN, USA bruceramshawmd@gmail.com

Wolfgang Reinpold

Department of Surgery and Hernia Center Gross Sand Hospital, Teaching Hospital of the University of Hamburg Gross Sand 3D 21107, Hamburg, Germany w.reinpold@gross-sand.de

Hrishikesh P. Salgaonkar

Minimally Invasive Surgical Centre, YLL School of Medicine, National University of Singapore Singapore 119074, Singapore hrishikesh.salgaonkar@gmail.com

Rudolf Schrittwieser

Department of Surgery LKH Hochsteiermark/Standort Bruck an der Mur Bruck an der Mur, Austria rudolf.schrittwieser@kages.at

Volker Schumpelick

Department of Surgery University Hospital Aachen Aachen 52074, Germany volker@schumpelick.de

Jochen Schwarz

Hernia Center Rottenburg Winghofer Medicum Rottenburg, Germany j-g.schwarz@t-online.de

Anil Sharma

Max Institute of Minimal Access, Metabolic and Bariatric Surgery Max Healthcare Delhi, New Delhi 110017, India asharma736@yahoo.in

Shreya Shetty

Department of Surgery Creighton University Medical Center 601 N 30th Street, Suite 3700 Omaha, NE 68131, USA ShreyaShetty@creighton.edu

Bernd Stechemesser

Hernia Surgery
Hernienzentrum Köln
Köln, Germany
bernd.stechemesser@hernienzentrumkoeln.de

Baukje Van Den Heuvel

Surgery, VUMC Amsterdam 1081 HV The Netherlands baukjevdh@vumc.nl

G.H. van Ramshorst

VU University Medical Center Amsterdam, The Netherlands gvanramshorst@rkz.nl

Burkhard H. A. von Rahden

Klinik für Allgemein-, Viszeral-, Gefäß und Kinderchirurgie, Zentrum für operative Medizin (ZOM)
Oberdürrbacherstraße 6
97080, Würzburg, Germany
Rahden_B@chirurgie.uni-wuerzburg.de

Dirk Weyhe

Department of Visceral Surgery
University of Oldenburg, School of Medicine
and Health Sciences, Pius-Hospital, Medical
Campus, Oldenburg, Germany
dirk.weyhe@pius-hospital.de
d.weyhe@elis-stiftung.de

Sujith Wijerathne

Minimally Invasive Surgical Centre YLL School of Medicine, National University of Singapore, Singapore 119074, Singapore sujithwijerathne@gmail.com

Ralf M. Wilke

District Hospital Calw-Nagold, Department of general, visceral and vascular surgery Nagold, Germany R.Wilke@klinikverbund-suedwest.de