# Post-cholecystectomy Bile Duct Injury

Vinay K. Kapoor
Editor

# Post-cholecystectomy Bile Duct Injury

Springer

*Editor*
Vinay K. Kapoor
Department of Surgical Gastroenterology
Sanjay Gandhi Post-Graduate Institute of Medical Sciences
Lucknow, Uttar Pradesh, India

ISBN 978-981-15-1235-3 ISBN 978-981-15-1236-0 (eBook)
https://doi.org/10.1007/978-981-15-1236-0



This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

*To,*

*D.M.,*
*my patient who died*
*because of a bile duct injury*
*after undergoing laparoscopic*
*cholecystectomy.*

# Foreword by Henri Bismuth

Cholecystectomy is one of the most frequent operations performed by the GI surgeon.

For this reason, even if the main complication of the trauma of the bile duct is rare, i.e., less than one percent, it has serious consequences due to several factors:

1. It is usually on a young patient.
2. It is a benign disease.
3. It is directly the fault of the surgeon.

As a consequence, the management of this complication has to be perfect for there is one additional factor which makes this complication even more important for the surgeon—it must be considered that in front of the surgeon, there are not only the patient and the family but, very quickly, the lawyer.

These considerations make really important the book of Dr Vinay K. Kapoor (Fig. 1) on bile duct injury.

It is a very complete book detailing all the aspects of this surgical situation. Dr Vinay K. Kapoor adds to his personal experience, which is well recognized, a complete updated review of all that has been published on this topic.

I strongly recommend the lecture of this book not only to the specialist—the HPB surgeon—but also, and I must say above all, to the GI surgeon and, by extension, to all those who may be involved in the management of a bile duct injury.


**Fig. 1** The Author (Vinay K. Kapoor) with Prof Henri Bismuth (Left) at International Hepato-Pancreato-Biliary Association (IHPBA) World Congress, Mumbai India 2008

Henri Bismuth
Institut Hépato-Biliaire Henri Bismuth
Villejuif Cedex, France

# Foreword by John L. Cameron

This publication by Professor Vinay K. Kapoor (Fig. 2) is an encyclopedia of bile duct injuries and iatrogenic benign biliary strictures. It covers anatomy, epidemiology, etiology, and classifications and provides definitions and information in terms of diagnosis and management, contains references, and states a variety of dos and don'ts. Techniques of repair and follow-up, and nonmedical issues such as costs, quality of life, and medico-legal, are also included. The author is obviously an experienced biliary surgeon, as his institution, the Sanjay Gandhi Post-Graduate Institute of Medical Sciences (SGPGIMS) at Lucknow in India, has managed more than 500 acute bile duct injuries as well as performed more than 700 repairs of a variety of iatrogenic benign biliary strictures in the last three decades. His Department of Surgical Gastroenterology maintains a prospective database that obviously allows easy access and evaluation of their data.

This book should be of value to surgical house officers, residents, fellows, and practicing surgeons who are interested in and take care of patients with biliary tract diseases.

**Fig. 2** The Author (Vinay K. Kapoor) with Prof John L. Cameron (Left) at International Hepato-Pancreato-Biliary Association (IHPBA) World Congress, Geneva Switzerland 2018

John L. Cameron
Johns Hopkins Hospital
Baltimore, MD, USA

# Foreword by Steven M. Strasberg

I am grateful to Dr Vinay K. Kapoor (Fig. 3) for asking me to write a brief foreword to his book on post-cholecystectomy bile duct injury. The main reason for being selected to write a foreword is that either the author knows the writer well or the writer is thought to be an expert on the subject of the book. I had a mild interest in bile duct injury during the open cholecystectomy era, but my interest rose sharply when I was appointed in 1992 to run a course to teach community general surgeons how to perform laparoscopic cholecystectomy. That course ran for 2 years and coincided with a sharp rise in referrals of patients with bile duct injuries, some of whom had been operated by the course attendees. These events were my entrée to working in this area for the past 25 years.

Many surgeons including Dr Vinay K. Kapoor have contributed to our understanding of the problem of bile duct injury, its prevention, and its treatment. Dr Vinay K. Kapoor is Senior Professor, Department of Surgical Gastroenterology, at the Sanjay Gandhi Postgraduate Institute of Medical Sciences in Lucknow, India. There he has accumulated considerable experience in the management of bile duct injuries. This book is the product of his experience and knowledge of the literature. The primary chapters cover the breadth of the subject understandably focusing on surgical aspects of the problem, but even the chapter on nonsurgical treatment is written by the author (Vinay K. Kapoor). To balance this personal approach, international experts were recruited to write commentaries on each chapter. These contributors comprise an international who's who in the field. The combination

of the chapters by Dr Vinay K. Kapoor and the commentaries by the experts provides a comprehensive summary of the field. The result will be of interest to trainees and hepato-pancreato-biliary (HPB) surgeons alike.

**Fig. 3** The Author (Vinay K. Kapoor) with Prof Steven M. Strasberg (Left), and Prof Henri Bismuth (Center) at International Hepato-Pancreato-Biliary Association (IHPBA) World Congress, Geneva Switzerland 2018

Steven M. Strasberg, MD FACS FRCS(C) FRCS(Ed)
Section of Hepato-Biliary-Pancreatic and GI Surgery,
Department of Surgery
Washington University School of Medicine
St. Louis, MO, USA

# Preface

I performed a laparoscopic cholecystectomy on D.M., a 50-year-old otherwise healthy male. After an apparently uneventful operation and smooth postoperative recovery, he was discharged on day one. On day two, he developed some nonspecific symptoms (anorexia, nausea, and vomiting) and received symptomatic treatment. In view of no improvement in his condition, he came back to the emergency services a day later and was found to have tachycardia, icterus, abdominal distention, and some tenderness. Bile leak was suspected. Ultrasonography revealed minimal interloop fluid. Isotope hepato-biliary scan showed bile leak. Computed tomography did not reveal any major collection. At endoscopic retrograde cholangiography, common bile duct could not be canulated. Laparotomy revealed a small amount of bile in the subhepatic space—no obvious bile duct injury could be identified; lavage and drainage was done. He, however, developed severe sepsis and multiple organ dysfunction syndrome and died on day six.

That was when I realized that laparoscopic cholecystectomy is not a "minor" operation and that a bile duct injury can be fatal.

M.A., a pretty 19-year-old bright medical student and daughter of a doctor couple, underwent laparoscopic cholecystectomy for gallstone disease in 2006. The operation was performed by a very senior, richly experienced, and highly reputed surgeon of the town. Unfortunately, she had bile leak in the postoperative period. Endoscopic retrograde cholangiography showed complete transection of the common bile duct. She had to undergo percutaneous catheter drainage to let bile out. Sepsis, however, continued and laparotomy had to be performed for lavage and drainage of the peritoneal cavity. Hepatico-jejunostomy was performed 3 months later by a liver transplant surgeon. She developed severe pulmonary sepsis and required intensive care including ventilation but fortunately recovered. During the follow-up, she had repeated attacks of cholangitis due to an anastomotic stricture. Repeated attempts at percutaneous dilatation failed. She was then referred to us when investigations revealed right lobe atrophy. She then underwent right hepatectomy with a fresh hepatico-jejunostomy to the left hepatic duct in 2008. She had thus undergone repeated hospitalizations, several interventions, and four major operations. At a very tender age of 21, she had a very close shave with death. Her parents spent lakhs of rupees (and lost wages), her younger siblings suffered at school, and she herself had lost precious 6 months at the medical school. Even after more than a decade, she still runs the risk of having anastomotic failure.

Her case made me realize that a bile duct injury is not only a medical but a social and financial disaster also.

My lifetime experience with management of patients with bile duct injury and the efforts that have gone into writing this book will be worthwhile if it helps the reader to properly manage and save the life and improve the quality of life of just one patient who has sustained a bile duct injury during cholecystectomy.

Lucknow, India Vinay K. Kapoor

# World Bile Duct Injury (BDI) Day

Global health community observes several specific days very year, namely World Health Day (7 April, to mark the anniversary of the founding of WHO in 1948), World Cancer Day (4 February), World Tuberculosis (TB) Day (24 March, to commemorate the date in 1882 when Dr Robert Koch announced his discovery of Mycobacterium tuberculosis, the bacillus that causes tuberculosis), World Kidney Day (second Thursday of March), World Malaria Day (25 April), World Hypertension Day (17 May), World Hepatitis Day (28 July), World Stroke Day (29 October), and even a Rare Disease Day (last day of February).

I propose that 12th April every year be observed as the *World Bile Duct Injury (BDI) Day*.

It was on April 12, 1953, that Anthony Eden, who succeeded Winston Churchill as the British Prime Minister (1955–1957), sustained a bile duct injury at (open) cholecystectomy. He had to undergo a total of as many as four operations, including a liver resection, but finally had to resign from his position because of health reasons related to the bile duct injury sustained at cholecystectomy.

I suggest that, on this day, every hospital, where cholecystectomies are performed, organize a continuing medical education (CME) or continuing professional development (CPD) program to emphasize the prevalence, importance, management, significance, and prevention of bile duct injury at cholecystectomy and promote the culture of a safe cholecystectomy.

# Acknowledgments

My views on the management of bile duct injury (BDI) and benign biliary stricture (BBS) are a result of the huge departmental experience with a large number of patients with BDI referred to us and a large number of BBS repairs performed by us. I am grateful to my faculty colleagues in the Department of Surgical Gastroenterology (SP Kaushik, Rajan Saxena, SS Sikora, Ashok Kumar, Sujoy Pal, Anu Behari, RK Singh, Anand Prakash, Biju Pottakkat, Ashok Kumar II, Supriya Sharma, Ashish Singh, and Rahul Rai), Department of Medical Gastroenterology (Late SR Naik, G Choudhuri, VA Saraswat, Rakesh Aggarwal, UC Ghoshal, Samir Mohindra, Praveer Rai, Abhai Verma, Gaurav Pandey, and Amit Goel), Department of Radiology (RK Gupta, SS Baijal, Sheo Kumar, Hira Lal, and Rajnikant Yadav), and Department of Nuclear Medicine (BK Das, SK Gambhir, and PK Pradhan) at the Sanjay Gandhi Post-Graduate Institute of Medical Sciences (SGPGIMS), Lucknow India. Special thanks to Supriya and Rahul for reading the final proofs.

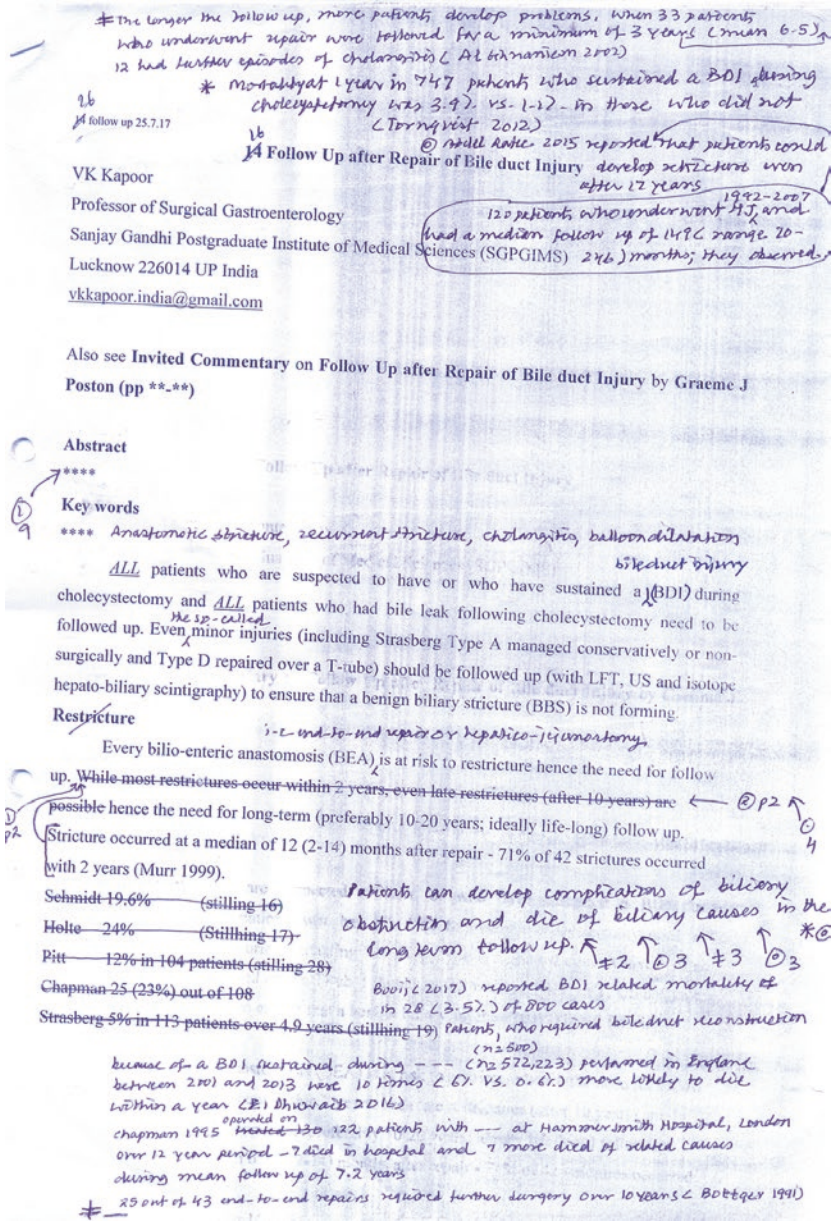
I am also grateful to SS Sikora, Vivek Singh, Anuj Sarkari, Biju Pottakkat, V Ranjit Hari, HM Lokesha, Joy Abraham, and Saurabh Galodha, our fellows who have prospectively collected, maintained, and analyzed the database of patients with bile duct injury and benign biliary stricture. Acknowledgments are also due to generations of fellows and residents (List on page xix) of my department who have looked after these patients in the last three decades.

I have been fortunate to have with me a pragmatic and humane physician, a skilled as well as safe surgeon, an intelligent yet unassuming scientist, a cooperative but critical coworker, and a reliable and dependable colleague in the form of Anu Behari who has shared with me the clinical, academic, and research responsibilities of our unit; many of the images used in this book are from patients admitted under her care in our unit.

I am thankful to my teachers and trainers (Late) Atm Prakash, Lalit K. Sharma, Tushar K. Chattopadhyay and Mahesh C. Misra at the All India Institute of Medical Sciences (AIIMS), New Delhi India.

Colleagues from the six continents, who are world-recognized authorities on the subject, readily accepted my invitation to write invited commentaries on the chapters written by me—I am indebted to all of them for their valuable comments.

Stalwarts of biliary surgery—Henri Bismuth, John L. Cameron, and Steven M. Strasberg—were kind enough to accept my request to write the forewords.



# Follow Up after Repair of Bile duct Injury

VK Kapoor
Professor of Surgical Gastroenterology
Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPGIMS)
Lucknow 226014 UP India
vkkapoor.india@gmail.com

Also see **Invited Commentary** on **Follow Up after Repair of Bile duct Injury** by **Graeme J Poston** (pp **-**)

**Abstract**

****

**Key words**

**** Anastomotic stricture, recurrent stricture, cholangitis, balloon dilatation, bile duct injury

ALL patients who are suspected to have or who have sustained a (BDI) during cholecystectomy and ALL patients who had bile leak following cholecystectomy need to be followed up. Even minor injuries (including Strasberg Type A managed conservatively or non-surgically and Type D repaired over a T-tube) should be followed up (with LFT, US and isotope hepato-biliary scintigraphy) to ensure that a benign biliary stricture (BBS) is not forming.

**Restricture**

Every bilio-enteric anastomosis (BEA) is at risk to restricture hence the need for follow up. ~~While most restrictures occur within 2 years, even late restrictures (after 10 years) are possible~~ hence the need for long-term (preferably 10-20 years; ideally life-long) follow up.

Stricture occurred at a median of 12 (2-14) months after repair - 71% of 42 strictures occurred with 2 years (Murr 1999).

~~Schmidt 19.6% (stilling 16)~~
~~Holte 24% (Stillhing 17)~~
~~Pitt 12% in 104 patients (stilling 28)~~
~~Chapman 25 (23%) out of 108~~
~~Strasberg 5% in 113 patients over 4.9 years (stillhing 19)~~

Naren Aggarwal, Teena Bedi, Rakesh Jotheeswaran, NS Pandian and Venkatesan Sathyapriya at Springer have been a big help and made my task easier by offering all possible logistic help.

Acknowledgments are also due to (Late) Ashish Agnihotri (database management), Anil Verma, Kumudesh Mishra, Sanjiv Singh, Priyanka Mishra, and Ram Lal (postal and telephonic follow-up of patients), Mithilesh Kumar Dwivedi, Ram Sanehi, and Pradeep Kumar (digital scanning of the images).

The final manuscript of this book has been made possible by my secretarial assistants Ajay Srivastava and KK Srivasatava who typed my almost illegible initial handwritten manuscripts and retyped the jumbled corrected typed scripts (Fig. 4) again and again, and yet again.

# Fellows and Residents

I would like to thank my Fellows and Residents of Department of Surgical Gastroenterology, Sanjay Gandhi Post-Graduate Institute of Medical Sciences (SGPGIMS), Lucknow UP, India

**Since 1989**

- A Lakshmaiah, Abhijit Chandra, Abhimanyu Kapoor, Abhinav A. Sonkar, Abishek Rajan, Ajay Sharma, Ajit K. Mishra,Alister J. Victor, Amit Rastogi, Anand Prakash, Anshuman Pandey, Anu Behari, Anuj Sarkari, Arpit Verma, Arun Kumar ML, Ashish K. Bansal, Ashish Singh, Ashok Kumar, Ashwini Kudari, Avinash Singh, Avinash Tank
- B Satyasree, Bappaditya Har, Biju Pottakkat, BN Sreedhar Murty, Brijendra Singh
- Ch Srinath, Chandan Chatterjee, Chirag Makkar
- Dasari Mukteshwar, Debashish Banerjee, Deepti Agdur, Devendra Choudhary, Devendra K. Khare, Devendra Naik, Disha Sood Syal, DKV Prasad
- G Srikanth, Gaurav Singh, Gajanan D. Wagholikar, Gogireddy N. Teja, Gurana K Rao, GV Rajgopal
- Hemant Jain, Hirdaya H. Nag, Himanshu Yadav, HM Lokesha
- Jayanth Reddy, Jitendra Agrawal, Joy Abraham, Joseph George
- Kailash C. Kurdia, Kanwal Jeet Singh, Kaushal Anand, Kadiyala V. Ravindra, Kiran Nath AV, K Raj Prasad, Kulbhushan Haldeniya, Kushal Mittal
- Luv K. Kacker
- M Mallappa, M Manisegaran, M Ramakrishna Rao, Magnus Jarasand, Mahendra Narwaria, Mahesh Sundaram, Mahesh Thombre, Manas Aggarwal, Manish Srivastava, Manoj Kumar, Mayank Gupta, Mayank Jain, Mohammad Ibrarullah
- N Murugappan, Nalini Kant Ghosh, Naresh V. Gabani, Neha Bhatt, Nikunj Gupta, Nisar H. Hamdani, Nishant K. Malviya, Nihar R Dash
- Palat Balachandran Menon, Paari Vijayaragavan, Pankaj Sihag, Parthasarathy G, Parvinder Singh, Peeyush Varshney, Prakash K. Sasmal, Prasad Kavatekar, Prasad Babu TLVD, Pratul R Gupta, Preeti Kimothi, Puneet Gupta, Puneet Puri

- RachapoodivenkataRaghavendra Rao, Raghuram S. Reddy, Rajendra Desai, Rajesh Kapoor, Rakesh Shivhare, Rakesh Singh, Ram Daga, Ranjit Vijayahari, Ravindra Budhwani, Ravula Phani Krishna, Rebala Pradeep, Ritu Khare, Rajendra N. Sonawane, Rohit Dhawan
- S Raju, S Roy Choudhary, S Shridhar, Sachin Arora, Sadiq S. Sikora, Sajeesh Sahadevan, Sandeep Awasthi, Sandeep Verma, Sanjai Srivastava, Sanjay S. Negi, Sanjiv P. Haribhakti, Satish TM, Saurabh Galodha, Selvakumar Balakrishnan, Senthil Ganesan, Shabi Ahmad, Shakeel Masood, Shaleen Agarwal, Shivendra Singh, Sidharth Jain, Somnath, Sourav Choudhury, Sunil T
- T Ravindranath, Tapas Mishra, Thakur D Yadav
- Utpal Anand
- V Vishwanath Reddy, Vijay K. Sharma, Vijay Ramachandran, Vikas Kumar, Vineet Gautam,Vinod Singhal, Vipin K. Sharma,Vivek Singh
- Wasif Ali
- Y Raghavendra Babu, Yash V Sinha

- **Special thanks** to Ajay Sharma, Ajit Mishra, Avinash Tank, Dasari Mukteshwar, Kailash Kurdia, Kanwal Jeet Singh, Manas Aggarwal, N Murugappan, Nishant K. Malviya, Prakash K. Sasmal, Prasad Kavatekar, Rakesh Singh, Sanjiv P. Haribhakti, Saurabh Galodha, Selvakumar Balakrishnan, Senthil Ganesan, Sourav Choudhury, Thakur D. Yadav, and V Vishwanath Reddy for reading the final proofs and making valuable corrections/ suggestions.

# Contents


1 **Surgical Anatomy of the Hepato-Biliary System** . . . . . 1
Vinay K. Kapoor

2 **Epidemiology of Bile Duct Injury** . . . . . 11
Vinay K. Kapoor

3 **Mechanisms of Causation of Bile Duct Injury** . . . . . 21
Vinay K. Kapoor

4 **Tips and Tricks for Safe Cholecystectomy** . . . . . 37
Vinay K. Kapoor

5 **Prevention of Bile Duct Injury During Cholecystectomy** . . . . . 47
Vinay K. Kapoor

6 **Pathophysiology of Bile Leak, Bile Loss, and Biliary Obstruction** . . . . . 61
Vinay K. Kapoor

7 **Non-biliary Injuries During Cholecystectomy** . . . . . 73
Vinay K. Kapoor

8 **Nomenclature and Classification of Bile Duct Injury** . . . . . 83
Vinay K. Kapoor

9 **Management of Bile Duct Injury Detected Intraoperatively** . . . 97
Vinay K. Kapoor

10 **Management of Bile Duct Injury Detected in the Post-Operative Period** . . . . . 109
Vinay K. Kapoor

11 **Consequences of Bile Duct Injury: External Biliary Fistula** . . . . . 127
Vinay K. Kapoor

12 **Consequences of Bile Duct Injury: Benign Biliary Stricture** . . . . . 135
Vinay K. Kapoor

**13 Surgical Management of Benign Biliary Stricture: Hepatico-Jejunostomy** . . . . . 147
Vinay K. Kapoor

**14 Surgical Management of Benign Biliary Stricture: Hepatectomy** . . . . . 177
Vinay K. Kapoor

**15 Non-surgical Management of Benign Biliary Stricture** . . . . . 185
Vinay K. Kapoor

**16 Follow-Up After Repair of Bile Duct Injury** . . . . . 195
Vinay K. Kapoor

**17 Healthcare Issues Related to Bile Duct Injury** . . . . . 207
Vinay K. Kapoor

**18 Socio-Economic and Medico-Legal Issues Related to Bile Duct Injury** . . . . . 213
Vinay K. Kapoor

**19 Institutional Experiences with Bile Duct Injury** . . . . . 225
Vinay K. Kapoor

**20 Bile Duct Injury Stories** . . . . . 237
Vinay K. Kapoor

Index . . . . . 239

# Contributors of Invited Commentaries

**Manali Arora** Department of Radiology, Pramukhswami Medical College, Anand, Gujarat, India

**Irving Benjamin** Department of Surgery, King's College London, London, UK

**L. Michael Brunt** Department of Surgery, Washington University School of Medicine, St Louis, MO, USA

Minimally Invasive Surgery, Washington University School of Medicine, St Louis, MO, USA

**Manuela Cesaretti** Istituto Italiano di Tecnologia, Genova, Italy

**Guido Costamagna** Department of Surgery, Università Cattolica del S. Cuore, Rome, Italy

Department of Gastroenterological, Endocrine-Metabolic and Nephro-Urologic Sciences, Fondazione Policlinico Universitario Agostino Gemelli, IRCCS, Università Cattolica del S. Cuore, Rome, Italy

IHU-USIAS, University of Strasbourg, Strasbourg, France

**Philip R. de Reuver** Department of Gastrointestinal Surgery, Radboudumc, Nijmegen, Netherlands

**Daniel J. Deziel** Department of Surgery, Rush University Medical Center, Chicago, IL, USA

**Abe Fingerhut** Section for Surgical Research (Prof Uranues), Department of Surgery, Medical University of Graz, Graz, Austria

Department of General Surgery (Prof Min Hua Zheng), Shanghai Minimally Invasive Surgery Center, Ruijin Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, P. R. China

**Dirk J. Gouma** Academic Medical Center, Amsterdam, The Netherlands

**Antonio Iannelli** Université Côte d'Azur, Nice, France

Centre Hospitalier Universitaire de Nice - Digestive Surgery and Liver Transplantation Unit, Archet 2 Hospital, Nice, France

Inserm, U1065, Team 8, Nice, France

**Eduard Jonas** Department of Hepato-pancreato-biliary Surgery, University of Cape Town Private Academic Hospital, Groote Schuur Hospital, Cape Town, South Africa

**J. E. J. Krige** Department of Hepato-pancreato-biliary Surgery, University of Cape Town Private Academic Hospital, Groote Schuur Hospital, Cape Town, South Africa

**Shweta Amrita Lakra** Department of Environmental Sciences, St Xaviers College, Ranchi, Jharkhand, India

**Keith D. Lillemoe** Department of Surgery, Massachusetts General Hospital, Boston, MA, USA

**Jessica Lindemann** Department of Hepato-pancreato-biliary Surgery, University of Cape Town Private Academic Hospital, Groote Schuur Hospital, Cape Town, South Africa

**Miguel A. Mercado** Department of Surgery, National Institute of Medical Science and Nutrition, "Salvador Zubirán", Mexico City, Mexico

**Marcos V. Perini** Department of Surgery, Austin Health, University of Melbourne, Melbourne, VIC, Australia

**Henry A. Pitt** Temple University Health System, Philadelphia, PA, USA

**Graeme J Poston** Department of Surgery, University of Liverpool, Liverpool, UK

Aintree University Hospital, Liverpool, UK

**Jose M. Schiappa** Hospital CUF Infante Santo, Travessa do Castro, Lisboa, Portugal

**Björn Törnqvist** Karolinska Institutet, Danderyds Hospital, Stockholm, Sweden

**T. M. van Gulik** Academic Medical Center, Amsterdam, The Netherlands

**John A. Windsor** Department of Surgery, University of Auckland, Auckland, New Zealand

HBP/Upper GI Surgeon, Auckland City Hospital, Auckland, New Zealand

# Abbreviations

| | |
|---|---|
| ALP | Alkaline phosphatase |
| ALT | Alanine aminotransferase |
| AST | Aspartate aminotransferase |
| BBA | Bilio-biliary anastomosis |
| BBS | Benign biliary stricture |
| BDI | Bile duct injury |
| BEA | Bilio-enteric anastomosis |
| CBD | Common bile duct |
| CHD | Common hepatic duct |
| CT | Computed tomography |
| CTA | Computed tomography angiography |
| EBF | External biliary fistula |
| ENBD | Endoscopic naso-biliary drainage |
| EPT | Endoscopic papillotomy |
| ERC | Endoscopic retrograde cholangiography |
| GB | Gallbladder |
| GGTP | Gamma glutamyl transpeptidase |
| HDL | Hepato-duodenal ligament |
| HJ | Hepatico-jejunostomy |
| IHBRD | Intrahepatic biliary radical dilatation |
| JHH | Johns Hopkins Hospital |
| LHD | Left hepatic duct |
| MRA | Magnetic resonance angiography |
| MRC | Magnetic resonance cholangiography |
| MRI | Magnetic resonance imaging |
| PCD | Percutaneous catheter drainage |
| PH | Portal hypertension |
| PTBC | Percutaneous transhepatic biliary catheterization |
| PTBD | Percutaneous transhepatic biliary drainage |
| PTC | Percutaneous transhepatic cholangiography |
| RHA | Right hepatic artery |
| RHD | Right hepatic duct |
| SBC | Secondary biliary cirrhosis |
| SOJ | Surgical obstructive jaundice |
| UGIE | Upper gastrointestinal endoscopy |
| US | Ultrasonography |