

Li-Ming Su  
*Editor*

# Atlas of Robotic Urologic Surgery

Second Edition

**EXTRAS ONLINE**



Springer

---

# Atlas of Robotic Urologic Surgery

---

Li-Ming Su  
Editor

# Atlas of Robotic Urologic Surgery

Second Edition



Springer

*Editor*

Li-Ming Su, M.D.  
Department of Urology  
University of Florida College of Medicine  
Gainesville, FL, USA

Videos can also be accessed at <http://link.springer.com/book/10.1007/978-3-319-45060-5>

ISBN 978-3-319-45058-2      ISBN 978-3-319-45060-5 (eBook)  
DOI 10.1007/978-3-319-45060-5

Library of Congress Control Number: 2017932443

© Springer International Publishing Switzerland 2017

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 Springer Nature  
The registered company is Springer International Publishing AG  
The registered company address is: Gwerbestrasse 11, 6330 Cham, Switzerland

*I would like to dedicate this book to my parents, Stanley and Phek Su, whose continued love, support, and sage advice have endured throughout my life and career. I also want to thank my immediate family, Maria and Sean as well as Cooper and Reilly for making me laugh and smile on a daily basis.*

*Li-Ming Su, M.D.*

---

## Preface

The introduction of robotic surgery to the field of urology has had a dramatic impact on practice patterns worldwide. Few events have had as significant an impact on the field of urology even greater than the introduction of shock wave lithotripsy, lasers, percutaneous surgery, and laparoscopy. Despite the widespread adoption of robotics into urologic practice, robotic urologic procedures remain technically complex and the skill sets required to perform robotic surgery differ significantly from that of traditional open surgery. Unlike open surgery where tactile feedback is frequently used as an intraoperative tool to provide the surgeon with critical information, during robotic surgery, the surgeon is immersed in an environment absent of haptic feedback where operative decisions are made based instead on subtleties and nuances provided primarily by visual cues. Visual cues such as vascularity, organ movement, tissue distortion, and adherence offer different and unique insights into the nature and behavior of organs and their interaction with surrounding structures such as blood vessels, fat, nerves, and muscles. As a result, surgeons are required to think and interpret surgical dissection in a way that is unique and different from their training in open surgery.

Since the introduction of robotic prostatectomy, there has been continued enthusiasm and expansion of robotic surgery in other areas of urologic surgery. The largest growth has been in the area of oncologic procedures with rapid adoption of robotic partial nephrectomy and radical cystectomy. In addition, robotic reconstructive and pediatric procedures continue to expand. As a result, the second edition of the *Atlas of Robotic Urologic Surgery* was compiled to address the continued expansion of robotics in the field of urologic surgery. As with the first edition of the *Atlas*, a detailed, step-by-step description of all currently performed robotic urologic procedures is provided by internationally recognized experts in the field. Each chapter is highly illustrated by the same artist to provide uniformity and standardization. Each procedural chapter is complemented by figures and intraoperative photographs, detailing the nuances of each technique. Emphasis is placed on operative setup, instrument and equipment needs, and surgical techniques for both the primary surgeon and the operative assistant. As such, this comprehensive surgical atlas provides educational value to both novice and advanced robotic surgeons as well as the operative assistant. My hope is that this atlas will provide unique insights into robotic urologic surgery and reduce the challenging learning curve of accomplishing these increasingly popular procedures.

Gainesville, FL, USA

Li-Ming Su, M.D.

---

## Contents

### Part I Getting Started in Robotic Surgery

<b>1 Establishing a Robotics Team and Practice . . . . .</b>	<b>3</b>
Friedrich-Carl von Rundstedt, Randee Regan, Tony Kim, and Richard E. Link	
<b>2 Robotics Training and Simulation . . . . .</b>	<b>9</b>
Steven V. Kheyfets and Chandru P. Sundaram	
<b>3 Robotic Instrumentation, Personnel, and Operating     Room Setup . . . . .</b>	<b>21</b>
Matthew J. Ziegelmann, Matthew T. Gettman, and John J. Knoedler	
<b>4 Anesthetic Considerations with Robotic Surgery . . . . .</b>	<b>41</b>
Christopher Giordano, Nikolaus Gravenstein, and Huong Thi Thu Le	

### Part II Robotic Surgery of the Upper Urinary Tract

<b>5 Robot-Assisted Total and Partial Adrenalectomy . . . . .</b>	<b>63</b>
Ravi Barod and Craig G. Rogers	
<b>6 Robotic Partial Nephrectomy: Transperitoneal Technique . . . . .</b>	<b>77</b>
John M. Shields, Sam B. Bhayani, and Li-Ming Su	
<b>7 Robotic Partial Nephrectomy: Advanced Techniques     and Use of Intraoperative Imaging . . . . .</b>	<b>93</b>
Sameer Chopra, Alfredo Maria Bove, and Inderbir S. Gill	
<b>8 Retroperitoneal Robotic Partial Nephrectomy . . . . .</b>	<b>103</b>
J. Joy Lee and James R. Porter	
<b>9 Robotic Radical Nephrectomy and Nephrectomy     with Caval Tumor Thrombus . . . . .</b>	<b>115</b>
Ronney Abaza	
<b>10 Robot-Assisted Radical Nephroureterectomy . . . . .</b>	<b>131</b>
Peter Y. Cai and Li-Ming Su	

<b>11</b>	<b>Robot-Assisted Pyeloplasty . . . . .</b>	145
	Raymond J. Leveillee and Kenan Ashouri	
<b>12</b>	<b>Robot-Assisted Laparoscopic Extended Pyelolithotomy and Ureterolithotomy . . . . .</b>	161
	Jessica N. Lange, Mani Menon, and Ashok K. Hemal	
<b>13</b>	<b>Robot-Assisted Ureteral Reconstruction . . . . .</b>	177
	Yuka Yamaguchi, Lee C. Zhao, and Michael Stifelman	
<b>14</b>	<b>Robot-Assisted Retroperitoneal Lymph Node Dissection . . . . .</b>	203
	Haidar M. Abdul-Muhsin, J. Joy Lee, James R. Porter, and Erik P. Castle	
<b>15</b>	<b>Complications and Management of Robotic Assisted Partial Nephrectomy . . . . .</b>	217
	Brandon J. Otto and Li-Ming Su	

### **Part III Robotic Surgery of the Lower Urinary Tract**

<b>16</b>	<b>Robot-Assisted Radical and Partial Cystectomy . . . . .</b>	227
	David M. Golombos, Padraig O'Malley, Gerald J. Wang, and Douglas S. Scherr	
<b>17</b>	<b>Transperitoneal Robot-Assisted Laparoscopic Radical Prostatectomy: Anterior Approach . . . . .</b>	245
	David I. Lee	
<b>18</b>	<b>Transperitoneal Robot-Assisted Radical Prostatectomy: Posterior Approach . . . . .</b>	261
	Jennifer Kuo, Jason Joseph, and Li-Ming Su	
<b>19</b>	<b>Extraperitoneal Robot-Assisted Radical Prostatectomy . . . . .</b>	283
	Jean V. Joseph, David Horovitz, and Matthew Lux	
<b>20</b>	<b>Robotic Radical Prostatectomy: Complex Case Management . . . . .</b>	297
	Hariharan Palayapalayam Ganapathi, Gabriel Ogaya-Pinies, Vladimir Mouraviev, and Vipul R. Patel	
<b>21</b>	<b>Robotic Simple Prostatectomy . . . . .</b>	309
	Carlos Eduardo Schio Fay, Sameer Chopra, and Monish Aron	
<b>22</b>	<b>Robotic Pelvic Lymphadenectomy: Standard and Extended Techniques . . . . .</b>	323
	Nishant D. Patel and Christopher J. Kane	
<b>23</b>	<b>Robotic-Assisted Inguinal Lymphadenectomy: The University of Texas M.D. Anderson Cancer Center Approach . . . . .</b>	331
	Isuru S. Jayaratnam, Surena F. Matin, and Curtis A. Pettaway	

---

<b>24</b>	<b>Robotic Rectovesical Fistula Repair . . . . .</b>	339
	Lawrence L. Yeung, James Mason, and Justin Dersch	
<b>25</b>	<b>Robotic Sacrocolpopexy . . . . .</b>	351
	Mary E. Westerman, Daniel S. Elliott, Mark S. Shimko, and George K. Chow	
<b>26</b>	<b>Robotic Vesicovaginal Fistula Repair . . . . .</b>	365
	Eric A. Schommer, Steven P. Petrou, and David D. Thiel	
<b>27</b>	<b>Robotic Surgical Procedures for Male Infertility . . . . .</b>	375
	Sijo J. Parekattil and Jamin V. Brahmbhatt	
<b>28</b>	<b>Complications and Management of Robotic Lower Urinary Tract Procedures . . . . .</b>	391
	Weil R. Lai and Raju Thomas	

#### **Part IV Robotic Pediatric Surgery**

<b>29</b>	<b>Pediatric Robotic Pyeloplasty . . . . .</b>	407
	Bruce J. Schlomer and Craig A. Peters	
<b>30</b>	<b>Robotic Partial Nephrectomy . . . . .</b>	419
	Craig A. Peters	
<b>31</b>	<b>Pediatric Robotic Anti-reflux Procedures. . . . .</b>	429
	Micah Jacobs and Craig A. Peters	
<b>32</b>	<b>Complications in Pediatric Robotic Surgery . . . . .</b>	439
	Craig A. Peters	

#### **Part V Single Port Robotic Surgery: Current Status and Future Considerations**

<b>33</b>	<b>Single-Port Robotic Surgery: Current Status and Future Considerations. . . . .</b>	445
	Pascal Mouracade, Daniel Ramirez, and Jihad H. Kaouk	

#### **Part VI Robotic Platforms: Past, Present, Future Perspectives**

<b>34</b>	<b>Robotic Surgery: Past, Present, and Future. . . . .</b>	459
	S. Duke Herrell	
	<b>Index. . . . .</b>	473

---

## Contributors

---

### Editor

**Li-Ming Su, M.D.** Department of Urology, University of Florida College of Medicine, Gainesville, FL, USA

---

### Authors

**Ronney Abaza, M.D., F.A.C.S.** Department of Robotic Surgery, Ohio Health Dublin Methodist Hospital, Dublin, OH, USA

**Haidar M. Abdul-Muhsin, M.B., Ch.B.** Department of Urology, Mayo Clinic Hospital, Phoenix, AZ, USA

**Monish Aron, M.D.** Catherine & Joseph Aresty Department of Urology, USC Institute of Urology, Keck School of Medicine, University of Southern California, Los Angeles, CA, USA

**Kenan Ashouri, M.S.** Department of Urology, Bethesda Hospital, Boynton Beach, FL, USA

**Ravi Barod, M.B.B.S., Ph.D., F.R.C.S. (Urol)** Vattikuti Urology Institute, Henry Ford Hospital, Detroit, MI, USA

**Sam B. Bhayani, M.D., M.S.** Department of Surgery and Urology, St. Louis, MO, USA

**Alfredo Maria Bove, M.D.** Catherine & Joseph Aresty Department of Urology, Keck School of Medicine, University of Southern California, Los Angeles, CA, USA

**Jamin V. Brahmbhatt, M.D.** Department of Urology, The PUR Clinic, South Lake Hospital, Orlando Health, Clermont, FL, USA

**Peter Y. Cai, M.D.** Department of Urology, University of Florida College of Medicine, Gainesville, FL, USA

**Erik P. Castle, M.D., F.A.C.S.** Department of Urology, Mayo Clinic Hospital, Phoenix, AZ, USA

**Sameer Chopra, M.S., M.D.** Catherine & Joseph Aresty Department of Urology, Keck School of Medicine, University of Southern California, Los Angeles, CA, USA

**George K. Chow, M.D.** Department of Urology, Mayo Clinic, Rochester, MN, USA

**Justin Dersch, M.D.** Department of Urology, University of Florida College of Medicine, Gainesville, FL, USA

**Daniel S. Elliott, M.D.** Department of Urology, Mayo Clinic, Rochester, MN, USA

**Matthew T. Gettman, M.D.** Department of Urology, Mayo Clinic, Rochester, MN, USA

**Inderbir S. Gill, M.D., M.Ch.** Catherine & Joseph Aresty Department of Urology, Keck School of Medicine, University of Southern California, Los Angeles, CA, USA

**Christopher Giordano, M.D.** Department of Anesthesiology, University of Florida College of Medicine, Gainesville, FL, USA

**David M. Golombos, M.D.** Department of Urology, New York Presbyterian Hospital—Weill Cornell Medical College, New York, NY, USA

**Nikolaus Gravenstein, M.D.** Department of Anesthesiology, University of Florida College of Medicine, Gainesville, FL, USA

**Hariharan Palayapalayam Ganapathi, M.D.** Global Robotic Institute, Florida Hospital, Celebration, FL, USA

**Ashok K. Hemal, M.D.** Department of Urology, Wake Forest Baptist Health, Winston-Salem, NC, USA

**S. Duke Herrell, M.D.** Department of Urologic Surgery, Vanderbilt University Medical Center, Nashville, TN, USA

**David Horovitz, M.D., F.R.C.S.C.** Department of Urology, Strong Memorial Hospital, University of Rochester Medical Center, Rochester, MN, USA

**Micah Jacobs, M.D., M.P.H.** Department of Urology, Children's Medical Center, University of Texas Southwestern, Dallas, TX, USA

**Isuru S. Jayaratnam, M.D.** Department of Urology, UT MD Anderson Cancer Center, Houston, TX, USA

**Jason Joseph, M.D.** Department of Urology, University of Florida College of Medicine, Gainesville, FL, USA

**Jean V. Joseph, M.D.** Department of Urology, Strong Memorial Hospital, University of Rochester Medical Center, Rochester, NY, USA

**Christopher J. Kane, M.D.** Department of Urology, University of California San Diego Health System, San Diego, CA, USA

**Jihad H. Kaouk, M.D.** Glickman Institute of Urology and Nephrology, Cleveland Clinic, Cleveland, OH, USA

**Steven V. Kheyfets, M.D.** Department of Urology, Indiana University School of Medicine, Indianapolis, IN, USA

**Tony Kim, M.D.** Baylor St. Luke's Medical Center, Houston, TX, USA

**John J. Knoedler, M.D.** Department of Urology, Mayo Clinic, Rochester, MD, USA

**Jennifer Kuo, M.D.** Department of Urology, University of Florida College of Medicine, Gainesville, FL, USA

**Weil R. Lai, M.D.** Department of Urology, Tulane University School of Medicine, New Orleans, LA, USA

**Jessica N. Lange, M.D.** Department of Urology, Wake Forest Baptist Health, Winston-Salem, NC, USA

**Huong Thi Thu Le, M.D.** Department of Anesthesiology, University of Florida College of Medicine, Gainesville, FL, USA

**Davi I. Lee, M.D.** Department of Surgery/Urology, University of Pennsylvania, Philadelphia, PA, USA

**J. Joy Lee, M.D.** Department of Urology, Swedish Medical Center, Seattle, WA, USA

**Raymond J. Leveillee, M.D., F.R.C.S.-G.** Department of Urology, Florida Atlantic University, Bethesda Hospital, Boynton Beach, FL, USA

**Richard E. Link, M.D., Ph.D.** Division of Endourology and Minimally Invasive Surgery, Scott Department of Urology, Baylor College of Medicine, Houston, TX, USA

**Matthew Lux, M.D.** Department of Urology, Kaiser Permanente Medical Center, San Diego, CA, USA

**James Mason, M.D.** Department of Urology, University of Florida College of Medicine, Gainesville, FL, USA

**Surena F. Matin, M.D., F.A.C.S.** Department of Urology, UT MD Anderson Cancer Center, Houston, TX, USA

**Mani Menon, M.D.** Department of Urology, Vattikuti Urology Institute, Henry Ford Health System, Detroit, MI, USA

**Pascal Mouracade** Glickman Institute of Urology and Nephrology, Cleveland Clinic, Cleveland, OH, USA

**Vladimir Mouraviev, M.D., Ph.D.** Global Robotic Institute, Florida Hospital, Celebration, FL, USA

**Gabriel Ogaya-Pinies, M.D.** Global Robotic Institute, Florida Hospital, Celebration, FL, USA

**Padraic O’Malley, M.D.** Department of Urology, New York Presbyterian Hospital—Weill Cornell Medical College, New York, NY, USA

**Brandon J. Otto, M.D.** Department of Urology, University of Florida College of Medicine, Gainesville, FL, USA

**Sijo J. Parekattil, M.D.** Department of Urology, The PUR Clinic, South Lake Hospital, Orlando Health, Clermont, FL, USA

**Nishant D. Patel, M.D.** Department of Urology, Cleveland Clinic Foundation, Cleveland, OH, USA

**Vipul R. Patel, M.D., F.A.C.S.** Global Robotic Institute, Florida Hospital, Celebration, FL, USA

**Craig A. Peters, M.D.** Pediatric Urology, Children’s Medical Center, University of Texas Southwestern, Dallas, TX, USA

**Curtis A. Pettaway, M.D.** Department of Urology, UT MD Anderson Cancer Center, Houston, TX, USA

**Steven P. Petrou, MD** Department of Urology, Mayo Clinic, Jacksonville, FL, USA

**James R. Porter, M.D.** Department of Urology, Swedish Medical Center, Seattle, WA, USA

**Daniel Ramirez, M.D.** Glickman Institute of Urology and Nephrology, Cleveland Clinic, Cleveland, OH, USA

**Randee Regan, B.S.N., R.N., C.N.O.R.** Surgical Services Administration, Houston Methodist Hospital, Houston, TX, USA

**Craig G. Rogers, M.D.** Vattikuti Urology Institute, Henry Ford Hospital, Detroit, MI, USA

**Douglas S. Scherr, M.D.** Department of Urology, New York Presbyterian Hospital—Weill Cornell Medical College, New York, NY, USA

**Carlos Eduardo Schio Fay, M.D.** Catherine & Joseph Aresty Department of Urology, USC Institute of Urology, Keck School of Medicine, University of Southern California, Los Angeles, CA, USA

**Bruce J. Schlomer, M.D.** Pediatric Urology, Children’s Medical Center, University of Texas Southwestern, Dallas, TX, USA

**Eric A. Schommer, M.D.** Department of Urology, Mayo Clinic Florida, Jacksonville, FL, USA

**John M. Shields** Department of Urology, University of Florida College of Medicine, Gainesville, FL, USA

**Mark S. Shimko, M.D.** Department of Urology, Mayo Clinic, Rochester, MN, USA

**Michael Stifelman, M.D.** Department of Urology, Hackensack University Medical Center, Hackensack, NJ, USA

**Chandru P. Sundaram, M.D.** Department of Urology, Indiana University School of Medicine, Indianapolis, IN, USA

**David D. Thiel, M.D.** Department of Urology, Mayo Clinic Florida, Jacksonville, FL, USA

**Raju Thomas, M.D., F.A.C.S., M.H.A.** Department of Urology, Tulane University School of Medicine, New Orleans, LA, USA

**Friedrich-Carl von Rundstedt, M.D.** Department of Urology, Friedrich-Schiller University, Jen, Germany

**Gerald J. Wang, M.D.** Department of Urology, New York Presbyterian Queens, Flushing, NY, USA

**Mary E. Westerman, M.D.** Department of Urology, Mayo Clinic, Rochester, MN, USA

**Yuka Yamaguchi, M.D.** Department of Urology, Highland Hospital, Oakland, CA, USA

**Lawrence L. Yeung, M.D.** Department of Urology, University of Florida College of Medicine, Gainesville, FL, USA

**Lee C. Zhao, M.D., M.S.** Department of Urology, NYU Langone Medical Center, NYU Urology Associates, New York, NY, USA

**Matthew J. Ziegelmann, M.D.** Department of Urology, Mayo Clinic, Rochester, MN, USA

---

## **Part I**

### **Getting Started in Robotic Surgery**