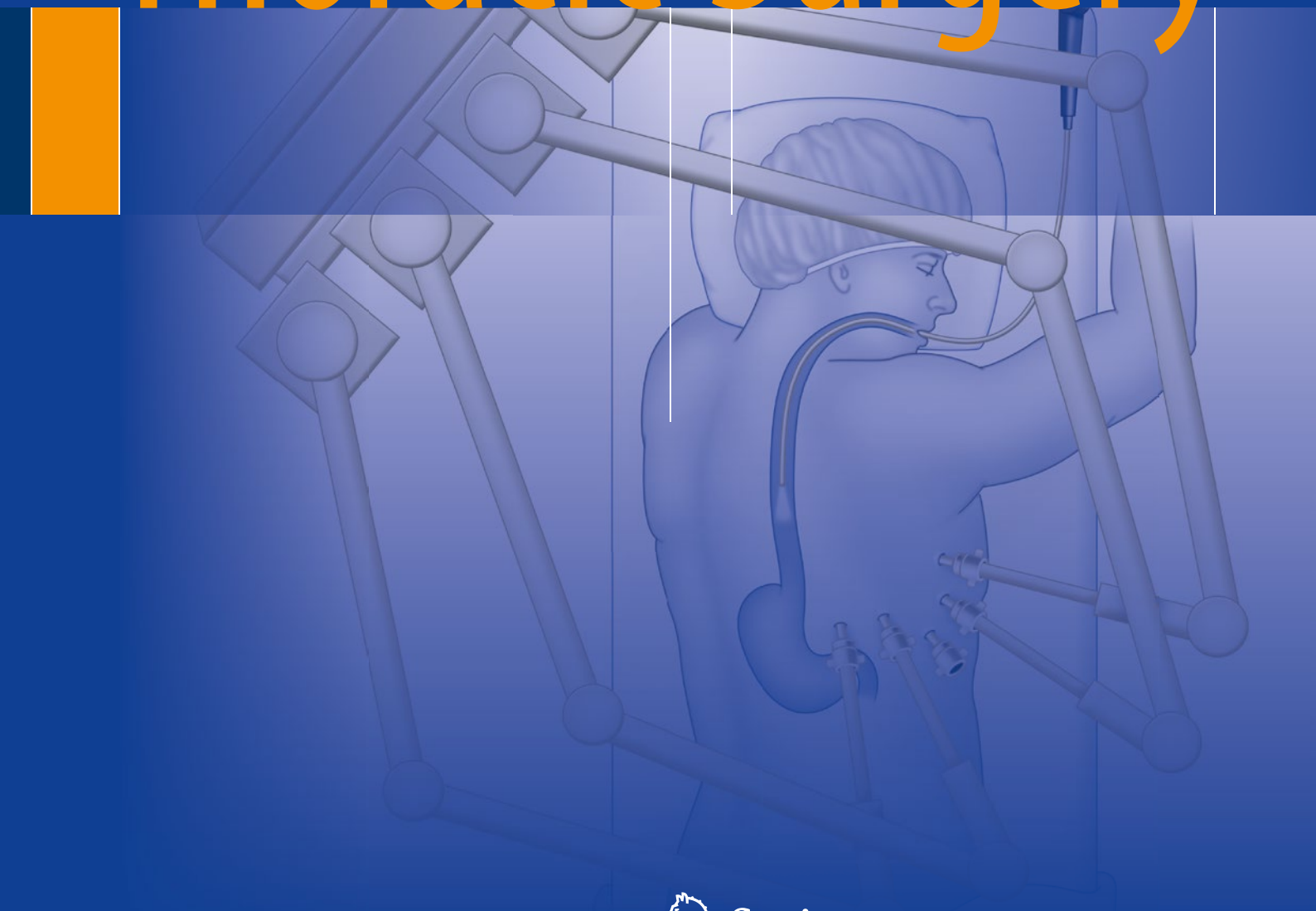
Kemp Kernstine
Editor

Atlas of Robotic Thoracic Surgery



Springer

Atlas of Robotic Thoracic Surgery

Kemp Kernstine
Editor

Atlas of Robotic Thoracic Surgery

Springer

Editor
Kemp Kernstine
Division of Thoracic Surgery
UT Southwestern
Dallas, TX
USA

ISBN 978-3-319-64506-3 ISBN 978-3-319-64508-7 (eBook)
https://doi.org/10.1007/978-3-319-64508-7

Library of Congress Control Number: 2018959882

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

I would like to dedicate this book to my dear wife, Cassandra; without her understanding, support, and encouragement, this book would not have been written. I would also like to thank our grown children and my mother for their understanding of the time necessary to complete this book.

Preface

Minimally invasive chest surgery was introduced in the early 1990s and the performance of complex minimally invasive chest procedures soon followed, but there were instrument limitations that hindered full acceptance by the thoracic community. It was not until 2000 that the Food and Drug Administration approved the *da Vinci* system for surgical use. The first descriptions of robotic chest procedures, such as lobectomy, esophagectomy, and thymectomy, appeared in the literature. For each procedure there were different approaches. So for the novice surgeon to learn how to perform the different robotic procedures, there have been few illustrations and photographs in the literature and limited Internet videos, especially there is no available resource repository that provides a description of commonly performed chest procedures and the details to minimize postoperative complications. To satisfy the need we have composed the first surgical atlas of robotic thoracic surgical procedures and it is written for those surgeons who wish to surgically treat their patients using robotic technology.

This book was the vision of Dr. Randolph "Ranny" Chitwood who orchestrated a plan for an atlas of different robotically performed cardiothoracic surgical procedures. The chapter authors were chosen nearly a decade ago for their experience with the procedures and their publication record. Initially, a single volume was planned, but because of the number of procedures and different approaches, it became impractical to put them into a single volume. We divided the book into two volumes, a cardiac and a thoracic surgery volume, each based on similar themes.

For the individual chapter the authors provide the background and indications supporting their robotic procedure, the operative setup, and the anesthetic management. Also included is the illustrated stepwise conduct of the operation outlining the key aspects of each procedure. Given their experience with their robotic surgical approach, they were asked to comment on what they had learned and to provide the tips to perform an efficient, safe, and successful case, and to describe the pitfalls and how have they may be overcome. Finally, the authors were asked to provide us the outcomes of the described robotic procedure(s). This information should be sufficient for a thoracic surgeon and the surgical team to perform the procedure.

Acknowledgements

I would like to thank Ms. Barbara Lopez-Lucio and Mr. Grant Weston from Springer Publishing for their thoughtful guidance and patience in the preparation of this book.

Contents

List of Editor and Contributors

Editor

Kemp Kernstine Sr., M.D., Ph.D. Division of Thoracic Surgery, Robert Tucker Hays Foundation Distinguished Chair in Cardiothoracic Surgery, University of Texas Southwestern Medical Center, Dallas, TX, USA

Contributors

Pietro Addeo, M.D. Department of Surgery, UIC, Chicago, IL, USA

Rafael S. Andrade, M.D. Section of Thoracic and Foregut Surgery, Department of Surgery, University of Minnesota Medical Center, Minneapolis, MN, USA

Florian Augustin, M.D. Department of Visceral, Transplantation and Thoracic Surgery, Innsbruck University Hospital, Innsbruck, Tirol, Austria

Johannes Bodner, M.D., M.Sc., F.E.B.T.S. Department of Thoracic Surgery, Klinikum Bogenhausen, Munich Community Hospital, Munich, Bayern, Germany

Jennifer A. Cameron, M.D., M.P.H. Department of Plastic Surgery, Aspirus Health System, St. Paul, MN, USA

Robert B. Cameron, M.D. Division of Thoracic Surgery, Department of Surgery, West Los Angeles Veterans Administration Medical Center, David Geffen School of Medicine at UCLA, Los Angeles, CA, USA

Javier H. Campos, M.D. Department of Anesthesia, University of Iowa Health Care, Iowa City, Iowa, USA

Ramzi K. Deeik, M.D. Department of Cardiothoracic Surgery, Santa Rosa Memorial Hospital, Santa Rosa, CA, USA

Nisha Dhanabalsamy, M.D. Department of Surgery, Section of Minimally Invasive and Robotic Surgery, University of Arizona, College of Medicine, Tucson, AZ, USA

Andres Falabella, M.D. City of Hope Helford Medical Clinical Research Hospital, Arcadia, CA, USA

Carlos A. Galvani, M.D. Department of Surgery, Division of General Surgery, Section of Minimally Invasive and Robotic Surgery, University of Arizona, College of Medicine, Tucson, AZ, USA

Farid Gharagozloo, M.D. Center for Advanced Thoracic Surgery, Global Robotics Institute, Florida Hospital Celebration, Celebration, FL, USA

Pier Cristoforo Giulianotti, M.D., F.A.C.S. Department of Surgery, Minimally Invasive and Robotic Surgery, University of Illinois Hospital and Health Sciences System, Chicago, IL, USA

Arielle Hodari Gupta, M.D. Department of Surgery, Henry Ford Hospital, Detroit, MI, USA

Jeroen M.H. Hendriks, M.D., Ph.D. Department of Thoracic and Vascular Surgery, Antwerp University Hospital, Edegem, Belgium

Santiago Horgan, M.D. UC San Diego Health—La Jolla, San Diego, CA, USA

Michael K.Y. Hsin, MBBChir, MA, FRCS, FHKAM Department of Cardiothoracic Surgery, Queen Mary Hospital, Hong Kong, China

Mahmoud Ismail, M.D. Department of Thoracic Surgery, University Medicine Berlin (Charité), Clinic for Surgery, Berlin, Germany

Dae Joon Kim, M.D., Ph.D. Department of Thoracic and Cardiovascular Surgery, Severance Hospital, College of Medicine, Yonsei University, Seoul, Republic of Korea

Christiaan Kroese, M.D. Department of Anesthesiology, Intensive Care and Emergency Surgery, University Medical Center Utrecht, Utrecht, The Netherlands

Patrick Lauwers, M.D. Department of Thoracic and Vascular Surgery, Antwerp University Hospital, Edegem, Belgium

Michael A. Maddaus, M.D. Department of Surgery, University of Minnesota, Minneapolis, MN, USA

Marc Margolis, M.D. MedStar Georgetown University Hospital, Washington, DC, USA

Ozanan R. Meireles, M.D. Department of General and Gastrointestinal Surgery, Harvard Medical School, Massachusetts General Hospital, Boston, MA, USA

Rudy Mercelis, M.D., Ph.D. Department of Neurology, Antwerp University Hospital, Edegem, Belgium

Pieter Mertens, M.D. Department of Anesthesiology, University Hospital Antwerp, Edegem, Belgium

Jeffrey A. Morgan, M.D., F.A.C.S. Division of Cardiothoracic Transplant and Circulatory Support, Advanced Heart Failure Center, Baylor College of Medicine, Texas Heart Institute, CHI Baylor St. Luke's Medical Center, Houston, TX, USA

Raghav Alampalli Murthy, M.B.B.S Department of Cardiovascular Surgery, Rady Children's Hospital, University of California San Diego, San Diego, CA, USA

Bernard J. Park, M.D. Department of Surgery, Memorial Sloan-Kettering Cancer Center, New York, NY, USA

Seong Yong Park, M.D., Ph.D. Department of Thoracic and Cardiovascular Surgery, Severance Hospital, College of Medicine, Yonsei University, Seoul, Republic of Korea

Jens C. Rückert, M.D., Ph.D. Department of Thoracic Surgery, University Medicine Berlin (Charité), Clinic for Surgery, Berlin, Germany

Ralph-Ingo Rückert, M.D., Ph.D. Department of Surgery, Franziskus-Krankenhaus Berlin, Berlin, Germany

Michael A. Savitt, M.D., M.S.E. Department of Cardiothoracic Surgery, Indiana University Health System, Muncie, IN, USA

Thomas Schmid, M.D. Department of Visceral, Transplantation and Thoracic Surgery, Center of Operative Medicine, Innsbruck University Hospital, Innsbruck, Tirol, Austria

Eric Strother, L.S. Washington Institute of Thoracic and Cardiovascular Surgery, The George Washington University Medical Center, Washington, DC, USA

Marc Swierzy, M.D. Department of Thoracic Surgery, University Medicine Berlin (Charité), Clinic for Surgery, Berlin, Germany

Barbara Tempesta, B.S.N., C.R.N.P. Center for Advanced Thoracic Surgery, Florida Hospital Celebration, Celebration, FL, USA

Keinich Ueda, M.D. Department of Anesthesia, University of Iowa Health Care, Roy and Lucille Carver College of Medicine, Iowa City, IA, USA

Senne Van Donink, B.M. Department of Thoracic and Vascular Surgery, University Hospital of Antwerp, Edegem, Belgium

Richard van Hillegersberg, M.D., Ph.D. Department of Surgical Oncology, University Medical Center Utrecht, Utrecht, The Netherlands

Paul E.Y. Van Schil, M.D., Ph.D. Department of Thoracic and Vascular Surgery, Antwerp University Hospital, Edgem, Belgium

Roy J.J. Verhage, M.D., Ph.D. Department of Surgical Oncology, University Medical Center Utrecht, Utrecht, The Netherlands

Innes Y.P. Wan, MBChB, FCSHK, FRCSEd, FHKAM Department of Surgery, The Chinese University of Hong Kong, Prince of Wales Hospital, Hong Kong, China

John K. Waters, M.D. Cardiothoracic Surgery, University of Texas Southwestern Medical Center, Dallas, TX, USA

Heinz Wykypiel, M.D. Department of Fisceral, Transplant and Thoracic Surgery, Medical University Innsbruck, Innsbruck, Tirol, Austria

Part I

Overview

Principles of Robotic Thoracic Surgery, Program Development and Equipment

1

Kemp Kernstine Sr.

Abstract

Robotic surgical technology, as it is applied to thoracic surgery procedures, offers surgeons greater dexterity, three-dimensional view, and tremor adjustment that results in the ability to perform complex procedures in small thoracic spaces. There is the potential of less trauma to surrounding structures that may result in less pain and debility. The selection and development of a surgical team with the interest, skills, knowledge, devotion, and focus to achieve quality outcomes is especially important in this new technology.

The overall principles of operating theater organization, body positioning, and port placement are reviewed in principle. For thoracic procedures, the available robotic and non-robotic instruments are reviewed in a general sense. There are great opportunities as robotic surgical technologies is further developed that should offer better outcomes for patients.

Keywords

Robotic surgery • Computer-assisted technology • Computer-assisted surgery • Surgical education

The purpose of this chapter is to provide the general principles of how the computer-assisted surgical system or robot can be set up by a surgical team for a safe and efficient thoracic surgical procedure. The remaining chapters deal with a number of thoracic surgical procedures by internationally recognized surgeons who at the time this book was conceived each had more than 5 years of robotic surgical experience in their specific approaches. If optimally used, the robot can minimize tissue manipulation; thus, should be at the least equivalent; if not superior to its open-large incision or the video-assisted counterpart.

There are numerous factors that determine the quality of a robotic surgical procedure; these include patient selection, the capabilities of the health care facility, the technique used by the surgeon, the surgeon's training, interest and knowledge of the pathology/procedure; the abilities of the surgical support team, and the quality of the hospital including the administration and all components of the medical and paraprofessional support staff. All of these summate to result in the morbidity, mortality and other outcomes for a given procedure. The new computer-assisted technology does not take the place of a coordinated team, but it does offer the capacity to minimize debility from the surgical approach.

Training the surgeons, the surgical team, and the hospital support system is complex; each has different needs. To date, training in surgical robotics has not been adequately incorporated into cardiothoracic residency training programs or postgraduate training opportunities in the technology and new surgical culture. Most robotic programs rely on industry for guidance, rather than on science and academia. There are no agreed-upon standards and no evidence-based guidelines to acquire the skills necessary to perform a safe and efficient robotic procedure. One example of a means to

K. Kernstine Sr., M.D., Ph.D. (✉)
Division of Thoracic Surgery, Department of Cardiovascular and Thoracic Surgery, Robert Tucker Hayes Foundation Distinguished Chair in Cardiothoracic Surgery, University of Texas Southwestern Medical Center, 5959 Harry Hines Blvd, POB1-10th Floor, Suite HP10.110, Dallas, TX 75390-8879, USA
e-mail: kemp.kernstine@utsouthwestern.edu

K. Kernstine (ed.), *Atlas of Robotic Thoracic Surgery*, https://doi.org/10.1007/978-3-319-64508-7_1