

# Contents

## VOLUME ONE

Contributing Authors xi  
Preface to the Seventh Edition xx  
Preface to the First Edition xxi

### PART A: The Lung, Pleura, Diaphragm, and Chest Wall

#### Section I Anatomy of the Chest Wall and Lungs

- 1 Anatomy of the Thorax..... 3  
Shari L. Meyerson and  
David A. Harpole, Jr.
- 2 Embryology of the Lungs..... 13  
Mala R. Chinoy
- 3 Ultrastructure and Morphometry of the  
Human Lung..... 39  
Matthias Ochs, Peter H. Burri, Joan Gil, and Ewald R. Weibel
- 4 Cellular and Molecular Biology of the  
Lung..... 61  
Steven J. Mentzer
- 5 Surgical Anatomy of the Lungs..... 71  
Thomas W. Shields
- 6 Lymphatics of the Lungs..... 87  
Thomas W. Shields

#### Section II Physiology of the Lungs

- 7 Pulmonary Gas Exchange..... 103  
Joan G. Matthews
- 8 Mechanics of Breathing..... 113  
Carl R. O'Donnell

#### Section III Thoracic Imaging

- 9 Radiographic Evaluation of the Lungs and  
Chest..... 121  
Jack Twersky
- 10 Computed Tomography of the Lungs,  
Pleura, and Chest Wall..... 149  
Jenny K. Hoang, Lacey Washington, and Wallace T. Miller, Jr.

- 11 Magnetic Resonance Imaging of the  
Thorax..... 167  
Warren B. Gefter
- 12 Positron Emission Tomography in Chest  
Diseases..... 199  
Perry Gerard and Richard L. Wahl
- 13 Radionuclide Studies of the Lung..... 215  
Vicente J. Caride
- 14 Ultrasound Techniques in Mediastinal,  
Lung, and Esophageal Disease..... 227  
Carolyn E. Reed

#### Section IV Diagnostic Procedures

- 15 Laboratory Investigations in the Diagnosis  
of Pulmonary Diseases..... 237  
Philip G. Robinson
- 16 Diagnostic Studies in Lung Cancer..... 265  
Lucian R. Chiriac and Massimo Loda
- 17 Bronchoscopic Evaluation of the Lungs and  
Tracheobronchial Tree..... 287  
William H. Warren and L. Penfield Faber
- 18 Invasive Diagnostic Procedures..... 301  
Umraan S. Ahmad and Matthew G. Blum
- 19 Video-Assisted Thoracic Surgery as a  
Diagnostic Tool..... 313  
Anthony P. C. Yim and Alan D. L. Sihoe

#### Section V Assessment of the Thoracic Surgical Patient

- 20 Pulmonary Physiologic Assessment of  
Operative Risk..... 325  
Mark K. Ferguson
- 21 Preoperative Cardiac Evaluation of the  
Thoracic Surgical Patient..... 339  
Jason C. Robins and Dan J. Fintel

#### Section VI Anesthetic Management of the General Thoracic Surgical Patient

- 22 Conduct of Anesthesia..... 349  
Brian P. Barrick and Robert W. Kyle

- 23 The Shared Airway: Management of the Patient With Airway Pathology** ..... 369  
Anne C. Kolker
- 24 Anesthesia for Pediatric General Thoracic Surgery** ..... 381  
Narasimhan Jagannathan and Kenneth Langen
- Section VII Pulmonary Resections**
- 25 Thoracic Incisions** ..... 391  
Matthew G. Blum and Willard A. Fry
- 26 General Features of Pulmonary Resections** ..... 401  
Gaetano Rocco and Thomas W. Shields
- 27 Thoracic Surgery in the Elderly** ..... 413  
Amanda Marsch and Joseph B. Zwischenberger
- 28 Technical Aspects of Lobectomy** ..... 421  
Stanley C. Fell and Malcolm M. DeCamp, Jr.
- 29 Sleeve Lobectomy** ..... 445  
L. Penfield Faber
- 30 Pneumonectomy and Its Modifications** .... 457  
Stanley C. Fell and Malcolm M. DeCamp, Jr.
- 31 Tracheal Sleeve Pneumonectomy** ..... 471  
Marc de Perrot
- 32 Segmentectomy and Lesser Pulmonary Resections** ..... 479  
Joseph LoCicero III
- 33 Instruments and Techniques of Video-Assisted Thoracic Surgery** ..... 487  
Alberto de Hoyos
- 34 Robotic-Assisted Surgery in Thoracic Diseases** ..... 509  
Kemp H. Kernstine, Natalie A. Ramirez, and Simeon Cua
- 35 Video-Assisted Thoracic Surgery for Wedge Resection, Lobectomy, and Pneumonectomy** ..... 523  
Ali Mahtabifard and Robert J. McKenna, Jr.
- 36 Median Sternotomy and Parasternal Approaches to the Lower Trachea and Mainstem Bronchi** ..... 533  
Aart Brutel de la Rivière and Henry A. van Swieten
- 37 Concomitant Cardiac and Pulmonary Operations** ..... 537  
Aart Brutel de la Rivière
- 38 Anterior Approach to Superior Sulcus Lesions** ..... 541  
Phillippe G. Darteville, Sacha Mussot, and Chuong D. Hoang
- 39 Complications of Pulmonary Resection** .... 551  
Benjamin E. Haithcock and Richard H. Feins
- 40 Management of Perioperative Cardiac Events** ..... 561  
John C. Alexander, Jr.
- Section VIII Postoperative Management of the General Thoracic Surgical Patient**
- 41 General Principles of Postoperative Care** ... 571  
Jason P. Shaw and Joseph LoCicero III
- 42 Mechanical Ventilation of the Surgical Patient** ..... 581  
James E. Lynch and Joseph B. Zwischenberger
- Section IX The Chest Wall**
- 43 Chest Wall Deformities** ..... 599  
Robert C. Shamberger
- 44 Lung Hernias of the Chest Wall** ..... 629  
Thomas W. Shields
- 45 Infections of the Chest Wall** ..... 633  
Joseph LoCicero III
- 46 Thoracic Outlet Syndrome (With Transaxillary, Supraclavicular, Posterior, and VATS Approaches)** ..... 641  
Harold C. Urschel, Jr.
- 47 Thoracoscopic Sympathectomy** ..... 657  
King F. Kwong and Mark J. Krasna
- 48 Anterior Transthoracic Approaches to the Spine** ..... 661  
Kamal Mansour
- 49 Chest Wall Tumors** ..... 669  
Bernard J. Park and Raja M. Flores
- 50 Chest Wall Reconstruction** ..... 679  
Daniel L. Miller and Kamal A. Mansour
- Section X The Diaphragm**
- 51 Embryology and Anatomy of the Diaphragm** ..... 689  
Thomas W. Shields
- 52 Pacing of the Diaphragm** ..... 695  
Marina Feldman and John A. Elefteriades
- 53 Congenital Posterolateral Diaphragmatic Hernias and Other Less Common Hernias of the Diaphragm in Infants and Children** ..... 709  
Marleta Reynolds
- 54 Foramen of Morgagni Hernia** ..... 719  
Alberto de Hoyos

<b>55 Tumors of the Diaphragm</b> . . . . .	<b>725</b>	<b>72 Malignant Pericardial Effusions</b> . . . . .	<b>885</b>
Robert J. Downey		Deepak Singh and Mark R. Katlic	
<b>Section XI The Pleura</b>			
<b>56 Anatomy of the Pleura</b> . . . . .	<b>729</b>	<b>73 Blunt and Penetrating Injuries of the</b> <b>Chest Wall, Pleura, and Lungs</b> . . . . .	<b>891</b>
Thomas W. Shields		Julian Guitron, Lynn C. Huffman, John A. Howington, and Joseph LoCicero III	
<b>57 Resorption of Gases from the Pleural</b> <b>Space</b> . . . . .	<b>735</b>	<b>74 Barotrauma and Inhalation Injuries</b> . . . . .	<b>903</b>
Yvon Cormier and Steve Provencher		Joseph B. Zwischenberger and Ryan Fischer	
<b>58 Pneumothorax</b> . . . . .	<b>739</b>	<b>75 Acute Respiratory Distress Syndrome</b> . . . . .	<b>913</b>
Alberto de Hoyos and Willard A. Fry		Joseph LoCicero III	
<b>59 Physiology of Pleural Fluid Production</b> . . . . .	<b>763</b>	<b>76 Management of Foreign Bodies of the</b> <b>Airway</b> . . . . .	<b>927</b>
Richard W. Light		Julie L. Wei and Lauren D. Holinger	
<b>60 Benign Pleural Effusion</b> . . . . .	<b>771</b>	<b>77 Diaphragmatic Injuries</b> . . . . .	<b>937</b>
Richard Lazzaro and Joseph LoCicero III		Julian Guitron, John Howington, and Joseph LoCicero III	
<b>61 Parapneumonic Empyema</b> . . . . .	<b>775</b>	<b>Section XIII The Trachea</b>	
Lei Yu and Mark J. Krasna		<b>78 Tracheostomy</b> . . . . .	<b>945</b>
<b>62 Postsurgical Empyema</b> . . . . .	<b>781</b>	Joseph LoCicero III	
Joseph I. Miller, Jr.		<b>79 Surgical Anatomy of the Trachea and Techniques</b> <b>of Resection and Reconstruction</b> . . . . .	<b>955</b>
<b>63 Tuberculous and Fungal Infections of the</b> <b>Pleura</b> . . . . .	<b>789</b>	Moishe Liberman and Douglas J. Mathisen	
Carlos A. Olivares-Torres, Jose Morales-Gomez, and Graciano Castillo-Ortega		<b>80 Management of Nonneoplastic Diseases of</b> <b>the Trachea</b> . . . . .	<b>967</b>
<b>64 Fibrothorax and Decortication of the</b> <b>Lung</b> . . . . .	<b>799</b>	Robert E. Merritt and Douglas J. Mathisen	
Thomas W. Rice		<b>81 Benign and Malignant Tumors of the</b> <b>Trachea</b> . . . . .	<b>981</b>
<b>65 Thoracoplasty: Indications and Surgical</b> <b>Considerations</b> . . . . .	<b>807</b>	L. Penfield Faber and William H. Warren	
Stanley C. Fell		<b>82 Compression of the Trachea by Vascular</b> <b>Rings</b> . . . . .	<b>999</b>
<b>66 Anatomy of the Thoracic Duct and</b> <b>Chylothorax</b> . . . . .	<b>827</b>	Carl L. Backer	
David W. Johnstone		<b>Section XIV Congenital, Structural, and Inflammatory</b> <b>Diseases of the Lung</b>	
<b>67 Localized Fibrous Tumors of the</b> <b>Pleura</b> . . . . .	<b>835</b>	<b>83 Congenital Lesions of the Lung</b> . . . . .	<b>1017</b>
Thomas W. Shields and Anjana V. Yeldandi		Marleta Reynolds	
<b>68 Diffuse Malignant Mesothelioma</b> . . . . .	<b>847</b>	<b>84 Pulmonary Complications of Cystic</b> <b>Fibrosis</b> . . . . .	<b>1033</b>
Valerie W. Rusch		Kristy Phillips, David R. Jones, and Christine I. Lau	
<b>69 Technique of Extrapleural Pneumonectomy</b> <b>for Diffuse Malignant Pleural</b> <b>Mesothelioma</b> . . . . .	<b>861</b>	<b>85 Congenital Vascular Lesions of the</b> <b>Lungs</b> . . . . .	<b>1053</b>
Lambros Zellos and David J. Sugarbaker		Michael J. Liptay and Edward Hong	
<b>70 Uncommon Tumors of the Pleura</b> . . . . .	<b>869</b>	<b>86 Chronic Pulmonary Emboli</b> . . . . .	<b>1067</b>
Thomas W. Shields and Anjana V. Yeldandi		Patricia A. Thistlethwaite, Michael Madani, and Stuart W. Jamieson	
<b>71 Malignant Pleural Effusions</b> . . . . .	<b>875</b>		
Steven A. Sahn			

- 87 Bullous and Bleb Diseases of the Lung. . . . . 1077**  
Talat Chughtai, Emilee Perron, Mathieu Simon, and  
Jean Deslauriers
- 88 Lung Volume Reduction. . . . . 1099**  
Anastasios Polimenakis and Keith S. Naunheim
- 89 Bacterial Infections of the Lungs and  
Bronchial Compressive Disorders. . . . . 1117**  
Joseph I. Miller, Jr.
- 90 Pulmonary Tuberculosis and Other  
Mycobacterial Diseases of the Lung. . . . . 1131**  
Gregory Campbell and Jeffrey Glassroth
- 91 Surgery for the Management of Mycobacterium  
Tuberculosis and Nontuberculous Mycobacterial  
(Environmental) Infections of the Lung. . . 1149**  
Marvin Pomerantz and John D. Mitchell
- 92 Mycotic and Actinomycetic Infections of  
the Lung. . . . . 1159**  
Shari L. Meyerson and David A. Harpole, Jr.
- 93 Pleuropulmonary Amebiasis. . . . . 1179**  
Mohan Verghese, Rajeev Kapoor, and Forrest C. Eggleston
- 94 Hydatid Disease of the Lung . . . . . 1187**  
Nickolaos N. Harlaftis, Homeros A. Aletas, and  
Panagiotis N. Symbas
- 95 Pulmonary Paragonimiasis and Its Surgical  
Complications . . . . . 1197**  
Hiroshi Mukae, Fukumi Nakamura-Uchiyama, and  
Yufigumi Nawa
- 96 Solitary Pulmonary Nodule . . . . . 1205**  
Wilson M. Clements, John F. DeRosimo, and Carolyn E. Reed
- 97 Diffuse Lung Disease. . . . . 1213**  
Francis C. Nichols and Sebastian Defranchi
- 98 Lung Transplantation . . . . . 1241**  
Felix G. Fernandez and G. Alexander Patterson
- Section XV Statistical Analysis and Trial Design**
- 99 Evidence-Based Thoracic Surgery . . . . . 1269**  
Jemi Olak and Paul J. Karanicolas
- 100 Clinical Trial Design . . . . . 1277**  
Mary W. Redman and John J. Crowley
- VOLUME TWO**
- Section XVI Carcinoma of the Lung**
- 101 Lung Cancer: Epidemiology and  
Carcinogenesis. . . . . 1281**  
Charles S. Dela Cruz, Lynn T. Tanoue, and Richard A. Matthay
- 102 Screening for Lung Cancer: Challenges for  
Thoracic Surgery. . . . . 1299**  
Brendon M. Stiles, Nasser K. Altorki, and  
David F. Yankelevitz
- 103 Investigation and Management of Nodules  
Less Than One Centimeter in Size. . . . . 1307**  
Ryosuke Tsuchiya
- 104 Pathology of Carcinoma of the Lung . . . . . 1311**  
Thomas W. Shields
- 105 The Sentinel Lymph Node in Non-Small-Cell  
Carcinoma of the Lung . . . . . 1341**  
Michael J. Liptay
- 106 Present Concepts in the Molecular Biology  
of Lung Cancer . . . . . 1345**  
David H. Harpole, Jr. and Mark Onaitis
- 107 Clinical Presentation of Lung Cancer. . . . . 1351**  
Matthew G. Blum
- 108 Radiologic Evaluation of Lung Cancer. . . . . 1361**  
Patrick J. Fultz and Richard H. Feins
- 109 Diagnosis and Staging of Lung Cancer. . . . . 1375**  
Carolyn E. Reed and Gerard A. Silvestri
- 110 Surgical Treatment of Non-Small-Cell  
Lung Cancer . . . . . 1387**  
Joseph LoCicero III
- 111 Lymph Node Dissection for Lung  
Cancer. . . . . 1427**  
Hisao Asamura
- 112 Unknown Primary Malignancy Metastatic  
to Thoracic Lymph Nodes. . . . . 1435**  
Marc Riquet, Eugenia Banu, and  
Christophe Foucault
- 113 Endoluminal Management of Malignant  
Airway Disease. . . . . 1441**  
Joseph LoCicero III
- 114 Basic Principles of Radiation Therapy  
in Locally Advanced Carcinoma of  
the Lung. . . . . 1449**  
Bahman Emami, Nena Mirkovic, and Julian Rosenman
- 115 Radiation Therapy for Carcinoma of the  
Lung . . . . . 1457**  
Ritsuko Komaki and James D. Cox
- 116 Adjuvant Chemotherapy for Non-Small-Cell  
Lung Cancer . . . . . 1469**  
Natasha B. Leighl and Frances A. Shepherd
- 117 Neoadjuvant Therapy for Non-Small-Cell  
Lung Cancer . . . . . 1483**  
Sunil Singhal, Joseph B. Shrager, and Larry R. Kaiser