Get Full Access and More at

**ExpertConsult.com** 

TOWNSEND

BEAUCHAMP • EVERS • MATTOX

SABISTON

# Textbook of SURGERY

The Biological Basis of Modern Surgical Practice

19TH
EDITION

# SABISTON TEXTBOOK OF SURGERY:

# THE BIOLOGICAL BASIS OF MODERN SURGICAL PRACTICE

# 19TH EDITION

#### **COURTNEY M. TOWNSEND, JR., MD**

Professor and John Woods Harris Distinguished Chairman Robertson-Poth Distinguished Chair in General Surgery Department of Surgery The University of Texas Medical Branch Galveston, Texas

#### R. DANIEL BEAUCHAMP, MD

J.C. Foshee Distinguished Professor and Chairman, Section of Surgical Sciences

Professor of Surgen and Cell and Developmental Biology and
Cancer Bology
Vande bilt University School of Medicine
Surgeon-in-Chief, Vanderbilt University Hospital
Nashville, Tenviesses

B. MARK EVERS, MD

Professor and Vice Chair for Research, Department of Surgery Director, Lucille P. Markey Cancer Center Markey Cancer Foundation Endowed Chair Physician-in-Chief, Oncology Service Line UK Healthcare The University of Kentucky Lexington, Kentucky

#### **KENNETH L. MATTOX, MD**

Professor and Vice Chairman Michael E. DeBakey Department of Surgery Baylor College of Medicine Chief of Staff and Chief of Surgery Ben Taub General Hospital Houston, Texas

with 1645 illustrations

ELSEVIER SAUNDERS



1600 John F. Kennedy Blvd. Ste 1800 Philadelphia, PA 19103-2899

SABISTON TEXTBOOK OF SURGERY

ISBN: 978-1-4377-1560-6 International Edition ISBN: 978-1-4557-1146-8

Copyright © 2012, 2008, 2004, 2001, 1997, 1991, 1986, 1981, 1977, 1972, 1968, 1964, 1960, 1956 by Saunders, an imprint of Elsevier Inc.

Copyright 1949, 1945, 1942, 1939, 1936 by Elsevier Inc.

Copyright renewed 1992 by Richard A. Davis, Nancy Davis Regan, Susan Okum, Joanne R. Artz, and Mrs. Mary E. Artz.

Copyright renewed 1988 by Richard A. Davis and Nancy Davis Regan.

Copyright renewed 1977 by Mrs. Frederick Christopher.

Copyright renewed 1973, 1970, 1967, 1964 by W.B. Saunders Company.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publisher. Details on how to seek permission, further information about the Publisher's permissions policies and our arrangements with organizations such as the Copyright Clearance Center and the Copyright Licensing Agency, can be found at our website: www.elsevier.com/permissions.

This book and the individual contributions contained in it are protected under copyright by the Publisher (other than as may be noted herein).

#### Notices

Knowledge and best practice in this field are constantly changing. As new research and experience broaden our understanding, changes in research methods, professional practices, or medical treatment may become necessary.

Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds, or experiments described herein. In using such information or methods they should be mindful of their own safety and the safety of others, including parties for whom they have a professional responsibility.

With respect to any drug or pharmaceutical products identified, readers are advised to check the most current information provided (i) on procedures featured or (ii) by the manufacturer of each product to be administered, to verify the recommended dose or formula, the method and duration of administration, and contraindications. It is the responsibility of practitioners, relying on their own experience and knowledge of their patients, to make diagnoses, to determine dosages and the best treatment for each individual patient, and to take all appropriate safety precautions.

To the fullest extent of the law, neither the Publisher nor the authors, contributors, or editors, assume any liability for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions, or ideas contained in the material herein.

Library of Congress Cataloging-in-Publication Data or Control Number

Sabiston textbook of surgery : the biological basis of modern surgical practice.—19th ed. / [edited by] Courtney M. Townsend Jr. ... [et al.].

p.; cm. Textbook of surgery

Includes bibliographical references and index.

ISBN 978-1-4377-1560-6 (hardcover : alk. paper)

I. Sabiston, David C., 1924-2009. II. Townsend, Courtney M. III. Title: Textbook of surgery. [DNLM: 1. Surgical Procedures, Operative. 2. General Surgery. 3. Perioperative Care. WO 500] 617—dc23

2011040621

Global Content Development Director: Judith Fletcher Content Developmental Manager: Maureen Iannuzzi Publishing Services Manager: Catherine Jackson Senior Project Manager: Rachel E. McMullen Design Direction: Louis Forgione

Printed in Canada

libraries in developing countries
www.elsevier.com | www.bookaid.org | www.sabre.org

Working together to grow

# CONTRIBUTORS

#### ANDREW B. ADAMS, MD, PHD

Associate, Department of Surgery, Emory Transplant Center, Emory University School of Medicine, Atlanta, Georgia Transplantation Immunobiology and Immunosuppression

#### CHARLES A. ADAMS, JR., MD

Chief of Trauma and Surgical Critical Care, Rhode Island
Hospital; Assistant Professor of Surgery, Alpert Medical School
of Brown University, Providence, Rhode Island
Surgical Critical Care

#### AHMED AL-MOUSAWI, MD

Clinical Fellow, Burns & Critical Care, Shriners Burns Hospital for Children, Department of Surgery, University of Texas Medical Branch, Galveston, Texas Metabolism in Surgical Patients

#### WADDAH B. AL-REFAIE, MD, FACS

Co-Director, Minnesota Surgical Outcomes Workgroup, Associate Professor of Surgery and Staff Surgeon, Division of Surgical Oncology, Department of Surgery, University of Minnesota and Minneapolis VAMC, Minneapolis, Minnesota

#### NANCY L. ASCHER, MD, PHD

Professor and Chair, Department of Surgery, University of California at San Francisco, San Francisco, California

Liver Transplantation

#### STANLEY W. ASHLEY, MD

Chief Medical Officer, Vice President for Medical Affairs, Brigham and Women's Hospital; Frank Sawyer Professor of Surgery, Harvard Medical School, Boston, Massachusetts

Acute Gastrointestinal Hemorrhage

#### PAUL S. AUERBACH, MD, MS, FACEP

Redlich Family Professor of Surgery, Department of Surgery,
Division of Emergency Medicine, Stanford University School of
Medicine, Stanford, California
Bites and Stings

#### BRIAN BADGWELL, MD

Assistant Professor, Department of Surgery, University of Arkansas for Medical Sciences, Little Rock, Arkansas Abdominal Wall, Umbilicus, Peritoneum, Mesenteries, Omentum, and Retroperitoneum

#### FAISAL G. BAKAEEN, MD, FACS

Chief of Cardiothoracic Surgery, The Michael E. DeBakey VA Medical Center; Associate Professor, Cardiothoracic Surgery, Baylor College of Medicine, Houston, Texas Acquired Heart Disease: Coronary Insufficiency

#### PHILIP S. BARIE, MD, MBA, FIDSA, FCCM, FACS

Professor of Surgery and Public Health, Weill Cornell Medical College; Chief, Preston A. (Pep) Wade Acute Care Surgery Service, New York—Presbyterian Hospital—Weill Cornell Medical Center, New York, New York

Surgical Infections and Antibiotic Use

#### B. TIMOTHY BAXTER, MD

Professor of Vascular Surgery, Department of Surgery, University of Nebraska Medical Center, Omaha, Nebraska The Lymphatics

#### R. DANIEL BEAUCHAMP, MD

J.C. Foshee Distinguished Professor and Chairman, Section of Surgical Sciences, Professor of Surgery and Cell and Developmental Biology and Cancer Biology, Vanderbilt University School of Medicine; Surgeon-in-Chief, Vanderbilt University Hospital, Nashville, Tennessee

Perioperative Patient Safety

### YOLANDA BECKER, MD, FACS

Professor of Surgery, Director, Kidney and Pancreas Program,
Division of Transplant Surgery, University of Chicago,
Chicago, Illinois
Kidney and Pancreas Transplantation

#### PAUL R. BEERY, MD

Clinical Assistant Professor, Department of Surgery, Ohio State
University Grant Medical Center, Columbus, Ohio
Surgery in the Pregnant Patient

#### DAVID H. BERGER, MD

Professor of Surgery and Vice-Chair, Michael E. DeBakey
Department of Surgery, Baylor College of Medicine; Operative
Care Line Executive, Michael E. DeBakey VA Medical Center,
Houston, Texas
Surgery in the Geriatric Patient

#### JOSHUA I.S. BLEIER, MD, FACS, FASCRS

Assistant Professor, Department of Surgery, University of Pennsylvania, Philadelphia, Pennsylvania

Colon and Rectum

#### DANIEL BORJA-CACHO, MD

HPB Fellow, Department of Surgery, University of Minnesota,
Minneapolis, Minnesota
Exocrine Pancreas

#### **HOWARD BRODY, MD, PHD**

Director, Institute for the Medical Humanities; John P. McGovern Centennial Chair in Family Medicine, Family Medicine, University of Texas Medical Branch, Galveston, Texas Ethics and Professionalism in Surgery

#### BRUCE D. BROWNER, MD, MS, FACS

Gray-Gossling Chair, Professor and Chairman Emeritus,
Department of Orthopedic Surgery, New England
Musculoskeletal Institute, University of Connecticut Health
Center; Director of Orthopaedics, Hartford Hospital,
Farmington, Connecticut

## Emergency Care of Musculoskeletal Injuries

# **THOMAS A. BUCHHOLZ, MD, FACR**Head, Division of Radiation Oncology, The University of Texas

M.D. Anderson Cancer Center, Houston, Texas

Diseases of the Breast

#### **BRIAN B. BURKEY, MD. FACS**

Vice-Chairman and Section Head, Head and Neck Surgery and Oncology, Head and Neck Institute, Cleveland Clinic Foundation; Adjunct Professor, Department of Otolaryngology, Vanderbilt University Medical Center, Nashville, Tennessee Head and Neck

#### KATHLEEN E. CARBERRY, BSN, RN, MPH

Research Specialist—Clinical Outcomes, Center for Clinical Outcomes, Congenital Heart Surgery Service, Texas Children's Hospital, Houston, Texas Congenital Heart Disease

#### CHARLIE C. CHENG, MD

Assistant Professor, Division of Vascular Surgery and Endovascular Therapy, University of Texas Medical Branch, Galveston, Texas

Peripheral Arterial Occlusive Disease

#### KENNETH J. CHERRY, JR., MD

Professor, Department of Surgery, School of Medicine, University of Virginia, Charlottesville, Virginia

Aorta

#### LORI CHOL MD

Assistant Professor, Division of Vascular Surgery and Endovascular Therapy, University of Texas Medical Branch, Galveston, Texas

Peripheral Arterial Occlusive Disease

#### DANNY CHU, MD

Associate Chief of Cardiothoracic Surgery, Operative Care Line, Michael E. DeBakey VA Medical Center; Assistant Professor of Surgery, Michael E. DeBakey Department of Surgery, Texas Heart Institute/Baylor College of Medicine, Houston, Texas Acquired Heart Disease: Coronary Insufficiency

#### DAI H. CHUNG, MD

Professor and Chairman, Janie Robinson and John Moore Lee
Endowed Chair, Department of Pediatric Surgery, Vanderbilt
University Medical Center, Nashville, Tennessee
Pediatric Surgery

#### WILLIAM G. CIOFFI, MD

Surgeon-in-Chief, Department of Surgery, Rhode Island Hospital; Professor and Chairman of Surgery, Alpert Medical School of Brown University, Providence, Rhode Island Surgical Critical Care

#### MICHAEL COBURN, MD

Professor and Chair, Scott Department of Urology, Baylor College of Medicine; Carlton-Scott Chair in Urologic Education; Chief of Urology, Ben Taub General Hospital, Houston, Texas Urologic Surgery

#### MARION E. COUCH, MD, PHD

Associate Professor, Department of Otolaryngology/Head and Neck Surgery, University of North Carolina School of Medicine, Chapel Hill, North Carolina Head and Neck

#### MICHAEL D'ANGELICA, MD

Associate Member, Department of Surgery, Memorial Sloan-Kettering Cancer Center; Associate Attending Surgeon, Department of Surgery, Memorial Hospital for Cancer and Allied Diseases; Associate Professor, Department of Surgery, Cornell University, Weill Medical College, New York, New York The Liver

#### ALAN DARDIK, MD, PHD (3) Isolated by South and South and

Associate Professor of Surgery, Yale University School of Medicine; Chief, Peripheral Vascular Surgery, VA Connecticut Healthcare System, West Haven, Connecticut Surgery in the Geriatric Patient

#### 

Professor and Chairman, Department of Surgery, State University of New York—Buffalo; Chief of Surgery, Kaleida Health System, Buffalo General Hospital, Buffalo, New York

Surgical Complications

#### JOSE J. DIAZ, MD, CNS, FACS, FCCM

Professor of Surgery, Chief Acute Care Surgery, R. Adams Cowley Shock Trauma Center, University of Maryland Medical Center, Baltimore, Maryland

Bedside Surgical Procedures; The Difficult Abdominal Wall

#### **QUAN-YANG DUH, MD**

Professor of Surgery, University of California San Francisco; Surgical Service, San Francisco VA Medical Center, San Francisco, California

The Adrenal Glands

#### WILLIAM D. DUTTON, MD, CDR, MC, USN

Instructor of Surgery, Acute Care Surgery Fellow, Division of Trauma and Surgical Critical Care, Vanderbilt University Medical Center, Nashville, Tennessee

The Difficult Abdominal Wall

#### TIMOTHY J. EBERLEIN, MD

Bixby Professor and Chairman of the Department of Surgery,
Spencer T. and Ann W. Olin Distinguished Professor and
Director, The Alvin J. Siteman Cancer Center, Barnes-Jewish
Hospital and Washington University School of Medicine;
Surgeon-in-Chief, Barnes-Jewish Hospital, St. Louis, Missouri
Tumor Biology and Tumor Markers

#### JAMES S. ECONOMOU, MD, PHD

Beaumont Professor of Surgery, Chief of Division of Surgical Oncology, Professor of Microbiology, Immunology and Molecular Genetics, Professor of Molecular and Medical Pharmacology, UCLA School of Medicine; Vice Chancellor for Research, University of California, Los Angeles, California Tumor Immunology and Immunotherapy

#### E. CHRISTOPHER ELLISON, MD

Robert M. Zollinger Professor and Chair, Department of Surgery, Ohio State University Medical Center, Columbus, Ohio Surgery in the Pregnant Patient

#### STEVEN R.T. EVANS, MD

Professor of Surgery, Chief Medical Officer and Vice President for Medical Affairs, Georgetown University Hospital, Washington, DC

Biliary System

#### B. MARK EVERS, MD

Professor and Vice-Chair for Research, Department of Surgery, Director, Lucille P. Markey Cancer Center, Markey Cancer Foundation Endowed Chair, Physician-in-Chief, Oncology Service Line UK Healthcare, The University of Kentucky, Lexington, Kentucky

Small Intestine

#### FARHOOD FARJAH, MD, MPH

Department of Surgery, University of Washington, Seattle, Washington

Evidence-Based Surgery: Critically Assessing Surgical Literature

#### MITCHELL P. FINK, MD

Professor, Departments of Surgery and Anesthesiology, Vice-Chair of Department of Surgery, UCLA David Geffen School of Medicine, Los Angeles, California The Inflammatory Response

#### NICHOLAS A. FIORE, II, MD, FACS

Cy-Fair Hand and Wrist, Houston, Texas

Hand Surgery

#### DAVID R. FLUM, MD, MPH

Professor of Surgery and Adjunct Professor of Health Services and Pharmacy, Director of the Surgical Outcomes Research Center, University of Washington, Seattle, Washington Evidence-Based Surgery: Critically Assessing Surgical Literature

#### YUMAN FONG, MD

Murray F. Brennan Chair in Surgery, Department of Surgery,
Division of Hepatopancreatobiliary Surgery, Memorial Sloan-Kettering Cancer Center; Professor of Surgery, Weill Cornell
Medical Center, New York, New York

The Liver

#### CHARLES D. FRASER, JR., MD

Chief and The Donovan Chair in Congenital Health Surgery,
Surgeon-in-Chief, Texas Children's Hospital; Professor of
Surgery and Pediatrics, Susan V. Clayton Chair in Surgery,
Baylor College of Medicine, Houston, Texas

Congenital Heart Disease

#### JULIE A. FREISCHLAG, MD

The William Steward Halsted Professor and Chair, Department of Surgery, Johns Hopkins University, Baltimore, Maryland Venous Disease

#### GERALD M. FRIED, MD, CM, FRCS(C), FACS, FCAHS

Adair Family Professor and Chairman, Department of Surgery, McGill University; Surgeon-in-Chief, McGill University Health Centre, Montreal, Quebec, Canada

Emerging Technology in Surgery: Informatics, Robotics, and Electronics

#### ROBERT D. FRY, MD

Emilie and Roland deHellebranth Professor of Surgery, Chief of the Division of Colon and Rectal Surgery, University of Pennsylvania Health System; Chairman, Department of Surgery, Pennsylvania Hospital, Philadelphia, Pennsylvania Colon and Rectum

#### DAVID A. FULLERTON, MD

Head, Division of Cardiothoracic Surgery, University of Colorado School of Medicine, Aurora, Colorado Acquired Heart Disease: Valvular

#### JAIME GASCO, MD

Assistant Professor, Division of Neurological Surgery, University of Texas Medical Branch, Galveston, Texas Neurosurgery

#### GERD G. GAUGLITZ, MMS, MD

Department of Dermatology and Allergy, Ludwig-Maximilian
University, Munich, Germany
Burns

#### JASON P. GLOTZBACH, MD

Postdoctoral Research Fellow, Stanford University Department of Surgery, Stanford, California; General Surgery Resident, University of North Carolina Department of Surgery, Chapel Hill, North Carolina Regenerative Medicine

#### S. PETER GOEDEGEBUURE, PHD

Research Associate Professor, Department of Surgery,
Washington University School of Medicine, St. Louis, Missouri
Tumor Biology and Tumor Markers

#### RAJA R. GOPALDAS, MD

Assistant Professor of Cardiothoracic Surgery, Hugh E.
Stephenson Department of Surgery, University of MissouriColumbia School of Medicine, Columbia, Missouri
Acquired Heart Disease: Coronary Insufficiency

#### MARJORIE C. GREEN, MD

Associate Professor of Medicine and Internist, Department of Breast Medical Oncology, Division of Cancer Medicine, The University of Texas M.D. Anderson Cancer Center, Houston, Texas

Diseases of the Breast

#### **OLIVER L. GUNTER, MD**

Assistant Professor, Division of Trauma and Surgical Critical Care, Vanderbilt University School of Medicine, Nashville, Tennessee Bedside Surgical Procedures

#### **GEOFFREY C. GURTNER, MD, FACS**

Professor and Associate Chair of Surgery, Stanford University
Department of Surgery, Stanford, California
Regenerative Medicine

#### FADI HANBALI, MD, FACS

Assistant Professor of Neurosurgery, Texas Tech University Health Science Center, El Paso, Texas Neurosurgery

#### JOHN B. HANKS, MD

C. Bruce Morton Professor and Chief, Division of General Surgery, Department of Surgery, University of Virginia, Charlottesville, Virginia Thyroid

#### ALDEN H. HARKEN, MD

Chairman, Department of Surgery, University of California at San Francisco (East Bay), San Francisco, California Acquired Heart Disease: Valvular

#### JENNIFER A. HELLER, MD

Assistant Professor of Surgery, Director of Johns Hopkins Vein Center, Johns Hopkins Bayview Medical Center, Baltimore, Marvland Venous Disease

#### DAVID N. HERNDON, MD, FACS

Chief of Staff, Shriners Burns Hospital for Children: Professor of Surgery and Jesse H. Jones Distinguished Chair in Burn Surgery, The University of Texas Medical Branch, Galveston, Texas

Burns; Metabolism in Surgical Patients

#### MICHAEL S. HIGGINS, MD, MPH

Professor, Department of Anesthesiology, Surgery and Biomedical Informatics, Vanderbilt University School of Medicine, Nashville, Tennessee Perioperative Patient Safety

#### ASHER HIRSHBERG, MD, FACS

Professor of Surgery. State University of New York Downstate College of Medicine; Director of Emergency Vascular Surgery, Kings County Hospital Center, Brooklyn, New York The Surgeon's Role in Mass Casualty Incidents

#### GINGER E. HOLT, MD

Associate Professor, Department of Orthopaedic Surgery, Vanderbilt Orthopaedic Institute, Vanderbilt University Medical Center, Nashville, Tennessee Bone Tumors

#### MICHAEL D. HOLZMAN, MD, MPH

Associate Professor of Surgery and Lester and Sara Jayne Williams Chair in Academic Surgery, General Surgery Division, Vanderbilt University Medical Center, Nashville, Tennessee The Spleen

#### KELLY K. HUNT, MD

Hamill Foundation Distinguished Professor of Surgery, Chief of Surgical Breast Oncology, M.D. Anderson Cancer Center, Houston, Texas

Diseases of the Breast

#### PATRICK G. JACKSON, MD

Chief of Gastrointestinal Surgery, Department of Surgery, Georgetown University Hospital, Washington, DC Biliary System

#### ERIC H. JENSEN, MD

Assistant Professor of Surgery, University of Minnesota, Minneapolis, Minnesota Exocrine Pancreas

#### MARC JESCHKE, MD, PHD, FACS, FRCSC

Director, Ross Tilley Burn Centre, Sunnybrook Health Sciences Centre; Associate Professor, Department of Surgery, Division of Plastic Surgery, University of Toronto: Senior Scientist, Sunnybrook Research Institute, Toronto, Ontario, Canada

#### HOWARD W. JONES, III, MD

Professor and Chairman, Department of Obstetrics and Gynecology, Vanderbilt University School of Medicine, Nashville, Tennessee Gynecologic Surgery

#### ALLAN D. KIRK, MD. PHD

Professor, Department of Surgery, Emory University School of Medicine, Atlanta, Georgia Transplantation Immunobiology and Immunosuppression

#### KIMBERLY S. KIRKWOOD, MD, FACS

Professor of Surgery, Department of Surgery, University of California at San Francisco, San Francisco, California The Appendix

#### SAE HEE KO, MD

Postdoctoral Research Fellow, Stanford University Department of Surgery, Stanford, California; General Surgery Resident, University of Pittsburgh Department of Surgery, Pittsburgh, Pennsylvania

Regenerative Medicine

#### TIEN C. KO. MD

Jack H. Mayfield, M.D. Distinguished Professor in Surgery; Vice Chairman for Harris County Hospital District, The University of Texas Health Science Center; Chief of Surgery, Lyndon B. Johnson General Hospital, Houston, Texas Molecular and Cell Biology

#### SETH B. KRANTZ, MD

Research Fellow, Robert H. Lurie Comprehensive Cancer Center and the Department of Surgery, Northwestern University Feinberg School of Medicine, Chicago, Illinois Stomach

#### MAHMOUD N. KULAYLAT, MD

Associate Professor of Surgery, Department of Surgery, State University of New York-Buffalo, Buffalo General Hospital, Buffalo, New York Surgical Complications

#### TERRY C. LAIRMORE, MD

Professor of Surgery and Director, Division of Surgical Oncology, Scott and White Memorial Hospital and Clinic, Texas A&M University System Health Science Center College of Medicine, Temple, Texas

The Multiple Endocrine Neoplasia Syndromes

#### CHRISTIAN P. LARSEN, MD, DPHIL

Joseph B. Whitehead Professor and Chairman of Surgery;
Associate Vice-President and Executive Director, Emory
Transplant Center, Emory University School of Medicine,
Atlanta, Georgia

Transplantation Immunobiology and Immunosuppression

#### MIMI LEONG, MD, MS

Assistant Professor, Plastic Surgery Division, Baylor College of Medicine; Staff Physician, Section of Plastic Surgery, Operative Care Line, Michael E. DeBakey Department of Surgery, Houston, Texas

Wound Healing

#### MICHAEL T. LONGAKER, MD, MBA, FACS

Deane P. and Louise Mitchell Professor and Vice-Chair in
Department of Surgery, Co-Director of Stanford Institute for
Stem Cell Biology and Regenerative Medicine, Director of
Program in Regenerative Medicine, Stanford University School
of Medicine, Palo Alto, California

Regenerative Medicine

#### ROBERT R. LORENZ, MD, MBA obuntant gnito A bris wolled no

Medical Director Payment Reform, Risk & Contracting; Head and Neck Surgery, Laryngotracheal Reconstruction and Oncology, Head and Neck Institute, Cleveland Clinic, Cleveland, Ohio Head and Neck

#### Division of Plastic Surgery, Department of See CM, AAM NHOL

Assistant Professor, Department of Surgery, University of California at San Francisco, San Francisco, California

The Appendix

#### Professor Vascular Surgery Departme DM, DUOMHAM. N AILLAN

Associate Professor of Surgery, Department of Surgery, University of Pennsylvania, Philadelphia, Pennsylvania Colon and Rectum

#### Assistant Professor, Department of Surger DM, IVHAM .M DIVAC

James R Hines Professor, Department of Surgery, Northwestern University Feinberg School of Medicine, Chicago, Illinois Stomach

#### John A. Schilling Professor and Chair HPM, MPM, MRIAM S. YARM

Associate Professor of Surgery, Director of the UCLA Center for Esophageal Disorders, UCLA David Geffen School of Medicine, Los Angeles, California

Esophagus

#### Professor and Chair, Department of MINORNAL Dris nozzelon

Associate Executive Director; American Board of Surgery,
Philadelphia, Pennsylvania
Hernias

#### DAVID J. MARON, MD, MBA

Associate Director of Colorectal Surgery Residency Program, Staff Surgeon, Department of Colorectal Surgery, Cleveland Clinic Florida, Weston, Florida Colon and Rectum

#### SILAS T. MARSHALL, MD

Resident, Department of Orthopaedic Surgery, University of Connecticut, Farmington, Connecticut

Emergency Care of Musculoskeletal Injuries

#### ABIGAIL E. MARTIN, MD

Assistant Professor of Surgery, Divisions of Pediatric General
Surgery and Abdominal Transplant Surgery, Duke University
Medical Center, Durham, North Carolina
Small Bowel Transplantation

#### R. SHAYN MARTIN, MD

Assistant Professor of Surgery, Department of Surgery,
Wake Forest School of Medicine; Director, Surgical Critical
Care, Wake Forest Baptist Medical Center, Winston-Salem,
North Carolina

Management of Acute Trauma 221M 2010 12 potno 3 looko M

#### NADER MASSARWEH, MD, MPH

Surgical Resident, Department of Surgery, University of Washington, Seattle, Washington Evidence-Based Surgery: Critically Assessing Surgical Literature

#### ADDISON K. MAY, MD

Professor of Surgery and Anesthesiology, Division of Trauma and Surgical Critical Care, Vanderbilt University Medical Center, Nashville, Tennessee Bedside Surgical Procedures

#### MARY H. MCGRATH, MD, MPH, FACS

Professor, Division of Plastic Surgery, Department of Surgery, University of California San Francisco, San Francisco, California Plastic Surgery

#### SHAUN MCKENZIE, MD

Assistant Professor, University of Kentucky Department of Surgery, Markey Cancer Center, Lexington, Kentucky Small Intestine

#### KELLY M. MCMASTERS, MD, PHD

Ben A. Reid, Sr. M.D. Professor and Chairman, Department of Surgery, University of Louisville School of Medicine, Louisville, Kentucky

Melanoma and Cutaneous Malignancies

#### J. WAYNE MEREDITH, MD, FACS

Richard T. Meyers Professor and Chair, Department of Surgery, Wake Forest University School of Medicine; Chief of Surgery, Wake Forest University Baptist Medical Center, Winston-Salem, North Carolina

Management of Acute Trauma

#### DEAN J. MIKAMI, MD

Assistant Professor of Surgery, Department of Surgery, Ohio State University Medical Center, Columbus, Ohio Surgery in the Pregnant Patient

#### **RICHARD S. MILLER, MD, FACS**

Professor of Surgery, Chief of the Division of Trauma and Surgical Critical Care, Vanderbilt University Medical Center, Nashville, Tennessee

The Difficult Abdominal Wall

#### AARON MOHANTY, MD

Assistant Professor, Pediatric Neurosurgery, University of Texas Medical Branch, Galveston, Texas Neurosurgery

#### JEFFREY F. MOLEY, MD

Professor of Surgery, Department of Surgery, Chief, Section of Endocrine and Oncologic Surgery, Washington University School of Medicine; Associate Director, Alvin Siteman Cancer Center; Attending Surgeon, Surgical Service, St. Louis VA Medical Center, St. Louis, Missouri

The Multiple Endocrine Neoplasia Syndromes

#### KEVIN MURPHY, MD, MCH, FRCS(PLAST.)

Hand Surgery Fellow, Division of Plastic Surgery, Baylor College of Medicine, Houston, Texas

Hand Surgery

#### ELAINE E. NELSON, MD, FACEP Missan A bins viagrue to nossellors

Chairman, Department of Emergency Medicine, Regional Medical Center of San Jose, San Jose, California Bites and Stings

#### **HEIDI NELSON, MD**

Fred C. Andersen Professor, Department of Surgery, Chair
Division of Surgery Research, Mayo Clinic, Rochester,
Minnesota

Anus

#### DAVID NETSCHER, MD Abutties to vitarevint possesions

Clinical Professor, Division of Plastic Surgery; Professor,
Department of Orthopedic Surgery, Baylor College of
Medicine; Adjunct Professor of Clinical Surgery (Plastic
Surgery), Weill Medical College, Cornell University; Chief of
Hand Surgery, St. Luke's Episcopal Hospital; Chief of Plastic
Surgery, VA Medical Center, Houston, Texas
Hand Surgery

#### **LEIGH NEUMAYER, MD**

Professor of Surgery, Department of Surgery, University of Utah; Jon and Karen Huntsman Presidential Professor in Cancer Research, Huntsman Cancer Institute; Co-Director, Multidisciplinary Breast Program, Huntsman Cancer Hospital, Salt Lake City, Utah

Principles of Preoperative and Operative Surgery

#### **ROBERT L. NORRIS, MD**

Professor, Department of Surgery and Chief, Division of Emergency Medicine, Stanford University School of Medicine, Stanford, California Bites and Stings

#### BRANT K. OELSCHLAGER, MD, FACS

Byers Endowed Professor of Esophageal Research, Chief, Gastrointestinal and General Surgery and Center for Videoendoscopic Surgery, University of Washington, Seattle, Washington

Hiatal Hernia and Gastroesophageal Reflux Disease

#### JOEL T. PATTERSON, MD

Associate Professor of Neurosurgery and Otolaryngology, Samuel R. Snodgrass, MD Professorship in Neurosurgery, Chief and Program Director, Division of Neurosurgery, Department of Surgery, The University of Texas Medical Branch, Galveston, Texas

Neurosurgery Chamman Department of Obsterios

#### CARLOS A. PELLEGRINI, MD, FACS, FRCSI(HON)

The Henry N. Harkins Professor and Chairman, Department of Surgery, University of Washington Medical Center, Seattle, Washington

Hiatal Hernia and Gastroesophageal Reflux Disease

#### REBECCA P. PETERSEN, MD, MSC

Senior Fellow and Acting Instructor, Department of Surgery,
University of Washington, Seattle, Washington
Hiatal Hernia and Gastroesophageal Reflux Disease

#### LINDA G. PHILLIPS, MD

Truman G. Blocker, Jr., MD, Distinguished Professor and Chief, Division of Plastic Surgery, Department of Surgery, The University of Texas Medical Branch, Galveston, Texas Wound Healing; Breast Reconstruction

#### **IRAKLIS I. PIPINOS, MD**

Professor, Vascular Surgery, Department of Surgery, University of Nebraska Medical Center, Omaha, Nebraska The Lymphatics

#### JASON POMERANTZ, MD

Assistant Professor, Department of Surgery, University of California San Francisco, San Francisco, California Plastic Surgery

#### RUSSELL G. POSTIER, MD

John A. Schilling Professor and Chairman, Department of Surgery, University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma Acute Abdomen

#### DONALD S. PROUGH, MD

Professor and Chair, Department of Anesthesiology, The University of Texas Medical Branch, Galveston, Texas Anesthesiology Principles, Pain Management, and Conscious Sedation

#### JOE B. PUTNAM, JR., MD

Ingram Professor of Surgery, Chairman of Department of Thoracic Surgery, Professor of Biomedical Informatics, Vanderbilt University School of Medicine, Nashville, Tennessee Lung, Chest Wall, Pleura, and Mediastinum

#### PETER RHEE, MD, MPH, DMCC

Professor of Surgery and Molecular Cellular Biology, Chief of Trauma, Critical Care and Emergency Surgery, University of Arizona, Tucson, Arizona

Shock, Electrolytes, and Fluid

#### TAYLOR S. RIALL, MD, PHD

Associate Professor, John Sealy Distinguished Chair in Clinical Research, Department of Surgery, University of Texas Medical Branch, Galveston, Texas

Endocrine Pancreas

#### WILLIAM O. RICHARDS, MD

Professor and Chair, Department of Surgery, University of South Alabama College of Medicine, Mobile, Alabama Morbid Obesity

#### NOE A. RODRIGUEZ, MD

Post-Doctoral Fellow Burn Research, Department of Surgery, University of Texas Medical Branch, Galveston, Texas Metabolism in Surgical Patients

# KENDALL R. ROEHL, MD

Assistant Professor, Division of Plastic and Reconstructive
Surgery, Texas A&M Health Sciences Center, Scott and White
Hospital Clinics, Temple, Texas
Breast Reconstruction

#### MICHAEL J. ROSEN, MD

Chief of Gastrointestinal Surgery, Director Case Comprehensive Hernia Center Department of Surgery, University Hospitals Case Medical Center, Cleveland, Ohio Hernias

#### **RONNIE A. ROSENTHAL, MD**

Professor of Surgery, Yale University School of Medicine, New Haven and Chief, Surgical Service, VA Connecticut Healthcare System, West Haven, Connecticut

Surgery in the Geriatric Patient

#### IRA RUTKOW, MD, MPH, DRPH

Clinical Professor of Surgery, University of Medicine and
Dentistry of New Jersey, Newark, New Jersey
History of Surgery

#### **LESLIE J. SALOMONE, MD**

Clinical Endocrinologist, Jacksonville, Florida Thyroid

#### HERBERT S. SCHWARTZ, MD selegnA 201 enoibeM to loon

Professor and Chairman, Department of Orthopaedic Surgery, Vanderbilt Orthopaedic Institute, Vanderbilt University Medical Center, Nashville, Tennessee Bone Tumors

#### STEVEN R. SHACKFORD, MD, FACS

Professor Emeritus, Department of Surgery, College of Medicine, University of Vermont, Burlington, Vermont Vascular Trauma

#### **JULIA SHELTON, MD**

Resident, Department of General Surgery, Vanderbilt University
Medical Center, Nashville, Tennessee
The Spleen

#### EDWARD R. SHERWOOD, MD, PHD

Professor, James F. Arens Endowed Chair, Vice Chair for Research, Department of Anesthesiology, The University of Texas Medical Branch, Galveston, Texas

Anesthesiology Principles, Pain Management, and Conscious Sedation

#### JASON K. SICKLICK, MD

Department of Surgery, Division of Surgical Oncology, Moores
UCSD Cancer Center, University of California at San Diego,
La Jolla, California
The Liver

#### MICHAEL B. SILVA, JR., MD

Fred J. and Dorothy E. Wolma Professor in Vascular Surgery,
Professor of Radiology, Chief, Division of Vascular Surgery and
Endovascular Therapy, Director, Texas Vascular Center,
University of Texas Medical Branch, Galveston, Texas
Peripheral Arterial Occlusive Disease

#### SAMUEL SINGER, MD a namoW bas marional moonus etaboseA

Chief, Gastric and Mixed Tumor Service, Department of Surgery, Memorial Sloan-Kettering Cancer Center, New York, New York Soft Tissue Sarcomas

#### MICHAEL J. SISE, MD

Clinical Professor of Surgery, University of California, San Diego School of Medicine; Medical Director, Division of Trauma, Scripps Mercy Hospital, San Diego, California

#### PHILIP W. SMITH, MD updated simely about infol bits rozzetor9

Assistant Professor of Surgery, Endocrine and General Surgery,
Department of Surgery, University of Virginia, Charlottesville,
Virginia
Thyroid

#### JULIE ANN SOSA, MD, MA, FACS

Associate Professor of Surgery and Medicine (Medical Oncology), Divisions of Endocrine Surgery and Surgical Oncology, Yale University School of Medicine, New Haven, Connecticut

The Parathyroid Glands

#### RONALD A. SQUIRES, MD (AL) assented assistant and assents the

Professor, Department of Surgery, University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma

### MICHAEL STEIN, MD and viscous in nozestors than an All maillive

Director of Trauma, Rabin Medical Center, Petach Tivka, Israel
The Surgeon's Role in Mass Casualty Incidents

#### ANDREW STEPHEN, MD

Staff, Division of Trauma and Surgical Critical Care, Rhode Island Hospital; Alpert Medical School of Brown University, Providence, Rhode Island Surgical Critical Care

#### **RONALD M. STEWART, MD**

Professor and Chair, Jocelyn and Joe Straus Endowed Chair, Department of Surgery, University of Texas Health Science Center San Antonio, San Antonio, Texas Bites and Stings

#### **DEBRA L. SUDAN, MD**

Professor of Surgery and Pediatrics, Division Chief Abdominal Transplant Surgery, Vice-Chair for Clinical Operations, Duke University School of Medicine, Durham, North Carolina Small Bowel Transplantation

#### MARCUS C.B. TAN, MBBS(HONS)

Resident in General Surgery, Department of Surgery, Barnes-Jewish Hospital, Washington University in St. Louis, St. Louis, Missouri

Tumor Biology and Tumor Markers solbal asset to vital vital

#### ALI TAVAKKOLIZADEH, MD

Associate Surgeon, Brigham and Women's Hospital; Assistant
Professor of Surgery, Harvard Medical School, Boston,
Massachusetts

Acute Gastrointestinal Hemorrhage

#### JAMES S. TOMLINSON, MD, PHD

Assistant Professor of Surgery, Division of Surgical Oncology, University of California, Los Angeles, Los Angeles, California Tumor Immunology and Immunotherapy

#### **COURTNEY M. TOWNSEND, JR., MD**

Professor and John Woods Harris Distinguished Chairman,
Robertson-Poth Distinguished Chair in General Surgery,
Department of Surgery, The University of Texas Medical
Branch, Galveston, Texas
Endocrine Pancreas

#### MARGARET C. TRACCI, MD, JD 23A4 AM 20M A202 MMA SILHUI

Assistant Professor, Division of Vascular and Endovascular Surgery, University of Virginia, Charlottesville, Virginia Aorta

#### RICHARD H. TURNAGE, MD

Academic Affiliation; Professor and Chairman; University of Arkansas for Medical Sciences (UAMS); Little Rock, Arkansas Abdominal Wall, Umbilicus, Peritoneum, Mesenteries, Omentum, and Retroperitoneum

#### **ROBERT UDELSMAN, MD, MBA**

William H. Carmalt Professor of Surgery and Oncology and Chairman, Department of Surgery, Yale University School of Medicine, New Haven, Connecticut The Parathyroid Glands

#### MARSHALL M. URIST, MD

Champ Lyons Professor and Vice-Chairman, Department of Surgery, University of Alabama at Birmingham, Birmingham, Alabama

Melanoma and Cutaneous Malignancies

#### CHERYL E. VAIANI, PHD

Assistant Professor, Clinical Ethicist, Institute for the Medical Humanities, University of Texas Medical Branch, Galveston, Texas

Ethics and Professionalism in Surgery

#### **DANIEL VARGO, MD, FACS**

Associate Professor, Department of Surgery, University of Utah School of Medicine, Salt Lake City, Utah Principles of Preoperative and Operative Surgery

#### SELWYN M. VICKERS, MD, FACS

Jay Phillips Professor and Chairman, Department Chair,
Department of Surgery, University of Minnesota, Minneapolis,
Minnesota

Exocrine Pancreas

#### BRADON J. WILHELMI, MD

Leonard Weiner Endowed Professor, Chief of Plastic Surgery, Residency Program Director, Division of Plastic and Reconstructive Surgery, University of Louisville, Louisville, Kentucky

Breast Reconstruction

#### COURTNEY G. WILLIAMS, MD

Associate Professor, Department of Anesthesiology, The University of Texas Medical Branch, Galveston, Texas Anesthesiology Principles, Pain Management, and Conscious Sedation

#### FELICIA N. WILLIAMS, MD

Chief Resident, Department of Surgery, East Carolina University, Pitt County Memorial Hospital, Greenville, North Carolina Burns

#### JAMES C. YANG, MD Mile village and washing to hoze

Senior Investigator, Surgery Branch, Center for Cancer Research, National Cancer Institute, Bethesda, Maryland Tumor Immunology and Immunotherapy

#### MICHAEL W. YEH, MD, FACS

Associate Professor of Surgery and Medicine (Endocrinology),
Chief, Section of Endocrine Surgery, UCLA David Geffen
School of Medicine, Los Angeles, California
The Adrenal Glands

# **FOREWORD**

"How many a man has dated a new era in his life from the reading of a book."

Henry David Thoreau (1817-1862)

This 19th edition of Sabiston Textbook of Surgery, the fourth edited by Dr. Townsend and his co-editors Drs. Maddox, Beauchamp, and Evers, extends the tradition of textbook excellence and leadership initiated 18 editions ago. The emphasis on clinical relevance and outcomes characteristic of earlier editions has been enhanced by the addition of three new chapters on organ transplantation, two new chapters in the vascular section: "The Aorta" and "Peripheral Arterial Occlusive Disease," and new chapters on the cutting edge topics of tumor immunology and immunotherapy and the "difficult abdominal wall." Other chapters have been embellished by inclusion of the latest information on biomaterials, organ procurement issues, specific gene therapy, biliary tumors, urinary system tumors, and simulation in surgery. Still other content has been revised to increase the focus on evidence-based practice by coverage of comparative effectiveness and patient-specific therapeutics.

The recruitment of more than 50 new authors and coauthors has guaranteed timeliness of the text, ensured full display of state of the art technology, and refreshed the trove of illustrations which by tradition have amplified and corroborated the text. The authors have also provided over 400 self-assessment questions which will assist the reader in preparing for and successfully achieving recertification.

As was true with the previous edition, ownership of the print text of this edition gives free access to the online product "Expert Consult," which includes full text and art, updates (journal articles selected by the editors and authors and keyed to chapter topics), board review questions, and videos on topics ranging from pleural effusion to hand transplantation and total aortic replacement. Expert Consult makes access to the text and all related material as convenient as the nearest computer.

This 19th edition of Sabiston successfully integrates print and electronic media to provide complete coverage of surgical practice. Full use of all features of this text will increase the reader's practice of evidence-based surgery, facilitate the reader's recertification activities, and promote the reader's acquisition and maintenance of the professional competencies. In short this is truly a text that as foretold by Thoreau will launch each reader on a new era in his or her surgical life.

BASIL A. PRUITT, JR., MD, FACS, FCCM

## PREFACE

Surgery continues to evolve as new technology, techniques, and knowledge are incorporated into the care of surgical patients. The 19th edition of the Sabiston Textbook of Surgery reflects these exciting changes and new information. We have incorporated eight new chapters and more than 77 new authors to ensure that the most current information is presented. For example, safety is paramount in the care of our surgical patients; our chapter on safety describes the surgeon's roles and responsibilities to ensure safety. We have included a new chapter on management of the difficult abdominal wall, which can be a vexing problem for even the most experienced surgeon. Distant surgery, using robotic and telementoring technology, has become a reality, and minimally invasive techniques are being used in almost all invasive procedures. This new edition has revised and enhanced the current chapters to reflect these changes. Finally, we have extensively updated chapters dealing with basic science

aspects that are important to surgeons and, in many cases, represent scientific advances in which surgeons are leading the charge. This is most evident in the chapters on tumor biology and tumor immunology, transplantation immunology, and the rapidly emerging field of regenerative medicine.

The primary goal of this new edition is to remain the most thorough, useful, readable, and understandable textbook presenting the principles and techniques of surgery. It is designed to be equally useful to students, trainees, and experts in the field. We are committed to maintaining this tradition of excellence, begun in 1936. Surgery, after all, remains a discipline in which the knowledge and skill of a surgeon combine for the welfare of all patients.

COURTNEY M. TOWNSEND, JR., MD

## **ACKNOWLEDGMENTS**

WE WOULD LIKE TO recognize the invaluable contributions of Karen Martin, Steve Schuenke, Eileen Figueroa, and administrator Barbara Petit. Their dedicated professionalism, tenacious efforts, and cheerful cooperation are without parallel. They accomplished whatever was necessary, often on short or immediate deadlines, and were vital for the successful completion of the endeavor.

Our authors, respected authorities in their fields, all busy physicians and surgeons, did an outstanding job in sharing their wealth of knowledge.

Evidence-Based Surgery: Critically

We would also like to acknowledge the professionalism of our colleagues at Elsevier: Maureen R. Iannuzzi, Content Developmental Manager; Louis Forgione, Senior Book Designer; Rachel E. McMullen, Senior Project Manager; Catherine Jackson, Publications Services Manager; and Judith Fletcher, Global Content Development Director.

# **VIDEO CONTENTS**

#### **SECTION 1 SURGICAL BASIC PRINCIPLES**

#### **CHAPTER 6 Metabolism in Surgical Patients**

VIDEO 6-1 Indirect Calorimetry

Noe A. Rodriguez

VIDEO 6-2 Dexa

Noe A. Rodriguez

VIDEO 6-3 Treadmill

Noe A. Rodriguez

#### **SECTION 2 PERIOPERATIVE MANAGEMENT**

#### **CHAPTER 15 Morbid Obesity**

VIDEO 15-1 Laparoscopic Roux-en-Y Gastric Bypass William O. Richards

**VIDEO 15-2** Laparoscopic Adjustable Gastric Band William O. Richards

**VIDEO 15-3** Laparoscopic Sleeve Gastrectomy William O. Richards

# CHAPTER 17 Emerging Technology in Surgery: Informatics, Robotics, and Electronics

VIDEO 17-1 Robot-Assisted Resection Guillermo Gomez

#### **SECTION 3 TRAUMA AND CRITICAL CARE**

#### **CHAPTER 19 The Difficult Abdominal Wall**

**VIDEO 19-1** Fistula in Open Abdomen Oliver Gunter

#### **SECTION 4 TRANSPLANTATION AND IMMUNOLOGY**

# CHAPTER 26 Transplantation Immunobiology and Immunosuppression

VIDEO 26-1 Results of World's First Successful Hand Transplant Darla K. Granger and Suzanne T. Ildstad

#### **SECTION 8 ENDOCRINE**

#### **CHAPTER 39 The Parathyroid Glands**

**VIDEO 39-1** Minimally Invasive Parathyroidism Robert Udelsman

#### **CHAPTER 42 The Multiple Endocrine**

**Neoplasia Syndromes** 

**VIDEO 42-1** Parathyroid Autotransplantation Jeffrey F. Moley

VIDEO 42-2 Extensive Thyroid Cancer with MEN 2B and MTC Jeffrey F. Moley

#### **SECTION 10 ABDOMEN**

#### **CHAPTER 51 The Appendix**

VIDEO 51-1 Laparoscopic 3-Port Appendectomy Jonathan Carter

#### VIDEO 51-2 Laparoscopic Appendectomy

in Pregnancy Lawrence W. Way

VIDEO 51-3 SILS Appendectomy

Kazunori Sato, Beemen N. Khalil, Ranna Tabrizi, and Jonathan Carter

#### **CHAPTER 56 Exocrine Pancreas**

VIDEO 56-1 Laparoscopic Distal Pancreatectomy Eric H. Jensen

#### **SECTION 11 CHEST**

## CHAPTER 58 Lung, Chest Wall, Pleura,

and Mediastinum

VIDEO 58-1 Pleural Effusion

Christopher J. Dente and Grace S. Rozycki

VIDEO 58-2 Pleural Sliding

Christopher J. Dente and Grace S. Rozycki

VIDEO 58-3 Pneumothorax

Christopher J. Dente and Grace S. Rozycki

#### **SECTION 12 VASCULAR**

#### **CHAPTER 62 Aorta**

VIDEO 62-1 Total Aortic Replacement Hazim J. Safi, Anthony L. Estrera, Eyal E. Porat, Ali Azizzadeh, and Riad Meada

#### **CHAPTER 63 Peripheral Arterial Occlusive Disease**

VIDEO 63-1 Aortoiliac Stenting

Michael B. Silva, Jr. and Lori Choi

VIDEO 63-2 Carotid Stenting

Michael B. Silva, Jr. and Lori Choi

VIDEO 63-3 Occlusive Diseases

Michael B. Silva, Jr. and Lori Choi

VIDEO 63-4 Renal Artery Stenting

Michael B. Silva, Jr. and Lori Choi

VIDEO 63-5 Splenic Aneurysm Coil Embolization

Michael B. Silva, Jr. and Lori Choi

**VIDEO 63-6** Internal Jugular Vein Christopher J. Dente and Grace S. Rozycki

## CHAPTER 65 Venous Disease

VIDEO 65-1 TRIVEX

Jennifer Heller

**VIDEO 65-2** Endovenous Ablation Jennifer Heller

#### **SECTION 13 SPECIALTIES IN GENERAL SURGERY**

#### **CHAPTER 71 Gynecologic Surgery**

VIDEO 71-1 Total Laparoscopic Hysterectomy Howard Jones and Amanda Yunker

**VIDEO 71-2** Unilateral salpingo-oophorectomy Howard Jones and Amanda Yunker

# CONTENTS

			1.6
SECTION 1 SURGICAL BASIC PRINCIPLES	dB#E	15 pheral Arterial Occlusive Businel quantity	
Less sesson and a present of the vertical particular and the sesson and the sesso		Morbid Obesity	358
History of Surgery	2	William O. Richards	
Ira Rutkow	Alen I	y and Pancreas Transplantstion 1510361	
ason is sicklick, in the property will be a sicklick to the sicklick of the si		Anesthesiology Principles,	
Ethics and Professionalism in Surgery	19	Pain Management, and	
Cheryl E. Vaiani and Howard Brody	Alene	Conscious Sedation	389
zemonbny2 sizsiqo		Edward R. Sherwood, Courtney G. Williams,	
Molecular and Cell Biology	24	and Donald S. Prough	
Tien C. Ko	1544	TON 5 SURGICAL ONCOLOGRIBANING . TI	
IOI M Jensen, Damel Bona-Cacho 2003AH9023 a MOI		Emerging Technology in Surgery:	
The Inflammatory Response	40	Informatics, Robotics, and Electronics	418
Mitchell P. Fink	Esopi	Gerald M. Fried	
5 a Shuron and Michael D. Holaman daish		<b>SECTION 3</b> TRAUMA AND CRITICAL CARE	emil
Shock, Electrolytes, and Fluid	66	18	
Peter Rhee	Steil	Management of Acute Trauma	430
lux Disease 1013		R. Shayn Martin and J. Wayne Meredith	Jannes S
Metabolism in Surgical Patients	120	19	
Ahmed Al-Mousawi, Noe A. Rodriguez, and David N. Herndon	120	The Difficult Abdominal Wall	471
<b>7</b> - 8 - Pulmaria II.		Jose J. Diaz, William D. Dutton, and Richard S. Miller	Kelly M.
Wound Healing MamodaA of Mot	151	20	
Mimi Leong and Linda G. Phillips	AS.	Emergency Care of asmoons2 suzai	
minal Wall, Umbilicus, Peritoneum,		Musculoskeletal Injuries	480
Regenerative Medicine	178	Silas T. Marshall and Bruce D. Browner	
Jason P. Glotzbach, Sae Hee Ko, Geoffrey C. Gurtner,	пв	21	
and Michael T. Longaker		Burns Stewart of Hotel All assemble has shown 52.2	521
9 R Gonaldas Danny Chu and Faical C. Rakasen		Marc Jeschke, Felicia N. Williams, Gerd G. Gauglitz,	
<b>Evidence-Based Surgery: Critically</b>		and David N. Herndon	
Assessing Surgical Literature	188	22	
David R. Flum, Farhood Farjah, and Nader Massarweh		Bites and Stings	548
101 namobdA		Robert L. Norris, Paul S. Auerbach, Elaine E. Nelson,	
Perioperative Patient Safety	201	and Ronald M. Stewart	
R. Daniel Beauchamp and Michael S. Higgins		23	
		Surgical Critical Care	563
<b>SECTION 2 PERIOPERATIVE MANAGEMENT</b>	Ali Tavak	Charles A. Adams, Jr., Andrew Stephen, and William G. Cioffi	
11		ses of the Breast	
		Bedside Surgical Procedures	595
Operative Surgery stank 8 died bas ivileM		Oliver L. Gunter, Jose J. Diaz, and Addison K. May	
Leigh Neumayer and Daniel Vargo			
12		The Surgeon's Role in Mass W. Loobild Ideos S	Kendali
Surgical Infections and Antibiotic Use		Casualty Incidents	604
Philip S. Barie		Asher Hirshberg and Michael Stein	
13 r xibnaqq		<b>SECTION 4</b> TRANSPLANTATION AND	
Surgical Complications		1MMUNOLOGY	Thyro
Mahmoud N. Kulaylat and Merril T. Dayton		Smith, Leslie J. Salomone, and John B. Hanks	Pinip W.
14:		Transplantation Immunobiology	
Surgery in the Geriatric Patient		and Immunosuppression	617
Alan Dardik, David H. Berger, and Ronnie A. Rosenthal		Andrew B. Adams, Allan D. Kirk, and Christian P. Larsen	
			xxi

27		40	
Liver Transplantation	655	Endocrine Pancreas	944
Nancy L. Ascher		Taylor S. Riall and Courtney M. Townsend, Jr.	
28 Richards		41 to Surgery of Surgery	067
Yolanda Becker Real Transplantation Yolanda Becker	666	The Adrenal Glands  Michael W. Yeh and Quan-Yang Duh	963
1 Management, and		and Professionalism in Surgery	
Abigail E. Martin and Debra L. Sudan		The Multiple Endocrine Neoplasia Syndromes Terry C. Lairmore and Jeffrey F. Moley	995
SECTION 5 SURGICAL ONCOLOGY	17	ular and Cell Biology 24	
ing Technology in Surgery:		SECTION 9 ESOPHAGUS	
Tumor Biology and Tumor Markers  Marcus C.B. Tan, S. Peter Goedegebuure, and	692	Hammatory Response supplies Fink	1012
Timothy J. Eberlein		Mary S. Maish	
Tumor Immunology and Immunotherapy James S. Economou, James C. Yang, and James S. Tomlinson	720	44 Hiatal Hernia and Gastroesophageal Reflux Disease	1067
32		Rebecca P. Petersen, Carlos A. Pellegrini, and	1007
Melanoma and Cutaneous Malignancies  Kelly M. McMasters and Marshall M. Urist		Brant K. Oelschlager	
33		SECTION 10 ABDOMEN	
Soft Tissue Sarcomas Samuel Singer Samuel Singer		45 Abdominal Wall, Umbilicus, Peritoneum,	
arshall and Bruce D. Browner		Mesenteries, Omentum,	Regen
Bone Tumors Herbert S. Schwartz and Ginger E. Holt	783	and Retroperitoneum Richard H. Turnage and Brian Badgwell	1088
		46	
SECTION 6 HEAD AND NECK	O Due	Hernias wilcoling arregued bess 8-92	
35 mail:2 has		Mark A. Malangoni and Michael J. Rosen	
Head and Neck	793	47 Acute Abdomen	1141
Robert R. Lorenz, Marion E. Couch, and Brian B. Burkey		Ronald A. Squires and Russell G. Postier	
CECTION T PREACT		48 Beaudhamp and Michael S. Higgins	
SECTION 7 BREAST	Sugic	Acute Gastrointestinal Hemorrhage	1160
Adams, Jr., Andrew Stephen, and William C. Golfi		Ali Tavakkolizadeh and Stanley W. Ashley	
<b>Diseases of the Breast</b> Kelly K. Hunt, Marjorie C. Green, and Thomas A. Buchholz	824	49	
5 Junter, Jose J. Diaz, and Addison K. May		Stomach base of Preoperative and based of Preoperative and Branch of Preoperative and B	
Breast Reconstruction	870	David M. Mahvi and Seth B. Krantz Magrue Swits	
Kendall R. Roehl, Bradon J. Wilhelmi, and Linda G. Phillips		30	
		Small Intestine Shaun McKenzie and B. Mark Evers	1227
SECTION 8 ENDOCRINE	Asher Hin		
ON 4 TRANSPLANTATION AND		51 The Appendix	1279
Thyroid Y20J0MUMMI	886	John Maa and Kimberly S. Kirkwood 2008531100000	
Philip W. Smith, Leslie J. Salomone, and John B. Hanks		N. Kulaylat and Memil T. Dayton	
lantation Immunobiology 98		Colon and Rectum	1294
The Parathyroid Glands  Julie Ann Sosa and Robert Udelsman And And Andreas Andreas XXII		Robert D. Fry, Najjia N. Mahmoud, David J. Maron, and Joshua I.S. Bleier	