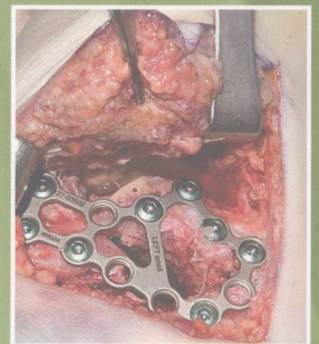
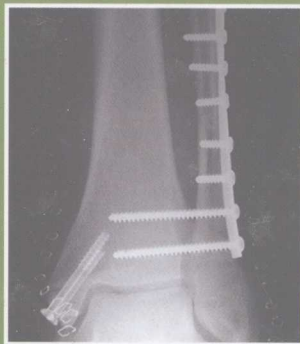
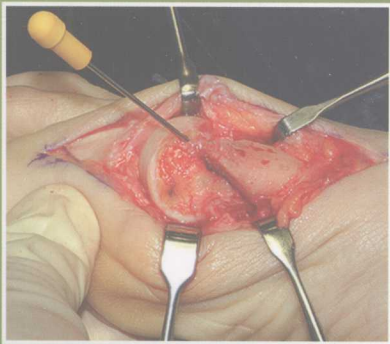


McGLAMRY'S
COMPREHENSIVE TEXTBOOK OF
**FOOT AND
ANKLE
SURGERY** FOURTH EDITION



Joe T. Southerland

Jeffrey S. Boberg • Michael S. Downey
Aprajita Nakra • Linnie V. Rabjohn



Wolters Kluwer
Health

Lippincott
Williams & Wilkins



**INCLUDES
FULLY
SEARCHABLE
TEXT
ONLINE**

McGLAMRY'S
**Comprehensive Textbook
of Foot and Ankle Surgery**
Fourth Edition

Acquisitions Editor: Brian Brown
Product Manager: Dave Murphy
Marketing Manager: Lisa Lawrence
Design Manager: Doug Smock
Manufacturing Manager: Benjamin Rivera
Prepress Vendor: SPi Global

4th edition

Copyright © 2013 Wolters Kluwer Health | Lippincott Williams & Wilkins.

All rights reserved. This book is protected by copyright. No part of this book may be reproduced or transmitted in any form or by any means, including as photocopies or scanned-in or other electronic copies, or utilized by any information storage and retrieval system without written permission from the copyright owner, except for brief quotations embodied in critical articles and reviews. Materials appearing in this book prepared by individuals as part of their official duties as U.S. government employees are not covered by the above-mentioned copyright. To request permission, please contact Lippincott Williams & Wilkins at Two Commerce Square, 2001 Market St., Philadelphia, PA 19103, via email at permissions@lww.com, or via our website at lww.com (products and services).

Printed in China

Library of Congress Cataloging-in-Publication Data

McGlamry's comprehensive textbook of foot and ankle surgery. — 4th ed. / editor, Joe T. Southerland ; section editors, Jeffrey S. Boberg, Michael S. Downey, Aprajita Nakra, Linnie V. Rabjohn.
p. ; cm.

Comprehensive textbook of foot and ankle surgery

Includes bibliographical references and index.

ISBN 978-0-7817-6580-0

I. McGlamry, E. Dalton. II. Southerland, Joe T. III. Title: Comprehensive textbook of foot and ankle surgery. [DNLM: 1. Foot—surgery. 2. Ankle—surgery. 3. Foot Deformities—surgery. 4. Foot Injuries—surgery. WE 880] 617.5'85059—dc23

2012006861

DISCLAIMER

Care has been taken to confirm the accuracy of the information present and to describe generally accepted practices. However, the authors, editors, and publisher are not responsible for errors or omissions or for any consequences from application of the information in this book and make no warranty, expressed or implied, with respect to the currency, completeness, or accuracy of the contents of the publication. Application of this information in a particular situation remains the professional responsibility of the practitioner; the clinical treatments described and recommended may not be considered absolute and universal recommendations.

The authors, editors, and publisher have exerted every effort to ensure that drug selection and dosage set forth in this text are in accordance with the current recommendations and practice at the time of publication. However, in view of ongoing research, changes in government regulations, and the constant flow of information relating to drug therapy and drug reactions, the reader is urged to check the package insert for each drug for any change in indications and dosage and for added warnings and precautions. This is particularly important when the recommended agent is a new or infrequently employed drug.

Some drugs and medical devices presented in this publication have Food and Drug Administration (FDA) clearance for limited use in restricted research settings. It is the responsibility of the health care provider to ascertain the FDA status of each drug or device planned for use in their clinical practice. The publishers have made every effort to trace the copyright holders for borrowed material.

To purchase additional copies of this book, call our customer service department at (800) 638-3030 or fax orders to (301) 223-2320. International customers should call (301) 223-2300.

Visit Lippincott Williams & Wilkins on the Internet: <http://www.lww.com>. Lippincott Williams & Wilkins customer service representatives are available from 8:30 am to 6:00 pm, EST.

9 8 7 6 5 4 3 2 1

VOLUME TWO

McGLAMRY'S

Comprehensive Textbook of Foot and Ankle Surgery

Fourth Edition

EDITOR

JOE T. SOUTHERLAND, DPM, FACFAS

*Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Arlington/Mansfield Foot and Ankle Centers
Arlington, Texas*

AUTHORS' EDITOR

DANIEL F. VICKERS, CAE

*Executive Director
The Podiatry Institute
Decatur, Georgia*

SECTION EDITORS

JEFFREY S. BOBERG, DPM, FACFAS

*Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
St. Louis, Missouri*

MICHAEL S. DOWNEY, DPM, FACFAS

*Faculty
The Podiatry Institute
Decatur, Georgia
Clinical Professor and Former Chairman, Department of Surgery
Temple University School of Podiatric Medicine
Chief, Division of Podiatric Surgery
Penn Presbyterian Medical Center
Private Practice
Ankle and Foot Medical Centers of the Delaware Valley
Philadelphia, Pennsylvania*

APRAJITA NAKRA, DPM, FACFAS

*Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Phoenix and Gilbert, Arizona*

LINNIE V. RABJOHN, DPM, FACFAS

*Private Practice
Arlington/Mansfield Foot and Ankle Centers
Arlington, Texas*



Wolters Kluwer | Lippincott Williams & Wilkins
Health

Philadelphia • Baltimore • New York • London
Buenos Aires • Hong Kong • Sydney • Tokyo

Contributing Authors

Patrick S. Agnew, DPM, FACFAS, FACFAP

Founder, Coastal Podiatry Group
Virginia Beach, Virginia
Past President, American College of Foot
and Ankle Pediatrics
Director, Podiatric Education
Eastern Virginia Medical School
Norfolk, Virginia

Michelle C. Anania, DPM, FACFAS

Private Practice
Ankle and Foot Care Centers
Youngstown, Ohio

Alan S. Banks, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Village Podiatry Centers
Tucker, Georgia

Gary R. Bauer, DPM

Associate Professor Emeritus
Department of Surgery
Temple University School of
Podiatric Medicine
Philadelphia, Pennsylvania

B. Hudson Berrey, MD, FACS

Professor, Department of
Orthopedic Surgery
Chief, Sarcoma and Musculoskeletal
Oncology
University of Florida Health Science Center
Jacksonville, Florida

Jeffrey S. Boberg, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
St. Louis, Missouri

James L. Bouchard, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Lawrenceville, Georgia

Thomas A. Brosky II, DPM, FACFAS

Faculty
The Podiatry Institute
Attending Surgeon
DeKalb Medical Center
Decatur, Georgia
Private Practice
Oakwood, Georgia

Michelle L. Butterworth, DPM, FACFAS

Affiliate Member
The Podiatry Institute
Decatur, Georgia
Private Practice
Pee Dee Foot Clinic
Kingstree, South Carolina

Bryan D. Caldwell, DPM, MS

Professor and Dean
Clinical Education and Operations
Kent State University College of
Podiatric Medicine
Independence, Ohio

Craig A. Camasta, DPM, FACFAS, FACPS

Faculty
The Podiatry Institute
Decatur, Georgia
St. Joseph's Hospital
Atlanta, Georgia

Brian B. Carpenter, DPM, FACFAS

Associate Professor
Department of Orthopedics
University of North Texas Health
Science Center
Fort Worth, Texas

Andrea D. Cass, DPM, AACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Smyrna, Georgia

Alan R. Catanzariti, DPM, FACFAS

Affiliate Member
The Podiatry Institute
Decatur, Georgia
The Western Pennsylvania Hospital
Philadelphia, Pennsylvania

Thomas J. Chang, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Clinical Professor and Past Chairman
Department of Podiatric Surgery
Samuel Merritt School of
Podiatric Medicine
Redwood Orthopedic Surgery Associates
Santa Rosa, California

Wen-Yin Choi Wang, DPM, AACFAS

East Bay Physicians Medical Group
Department of Podiatry
Advanced Wound Care Center
Sutter Delta Medical Center
Antioch, California

Jeffrey C. Christensen, DPM, FACFAS

President and Founder
Ankle and Foot Clinics Northwest
Past Section Chairman and
Attending Surgeon
Department of Orthopedics,
Podiatric Section
Swedish Medical Center
Seattle, Washington

Luke D. Cicchinelli, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
East Valley Foot and Ankle Specialists
Mesa, Arizona

Annalisa Y. Co, DPM

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Sacramento, California

Randall J. Contento, DPM, AACFAS

Private Practice
Central Ohio Podiatry Group
Westerville, Ohio

Keith D. Cook, DPM, FAFAS

Director, Podiatric Medical Education
University Hospital
University of Medicine and Dentistry of
New Jersey
Newark, New Jersey

Stephen V. Corey, DPM, FAFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Pee Dee Foot Clinic
Kingstree, South Carolina

Timothy W. Crislip, DPM

Private Practice
Columbia Orthopaedic Group
Columbia, Missouri

Lopa Dalmia, DPM

Faculty
The Podiatry Institute
Decatur, Georgia
Associate Physician, Podiatric Surgery
University of California Davis
Health System
Citrus Heights, California

Damien M. Dauphinée, DPM, FAFAS, FAENS, FACCWS, CWS-P

Medical Director
Center for Wound Healing and
Hyperbaric Medicine
North Texas Hospital
Denton, Texas

William T. DeCarbo, DPM, AACFAS

Fellowship Trained Foot and
Ankle Surgeon
Faculty
Mountain Valley Foot and Ankle
Reconstruction Fellowship
The Orthopedic Group
Pittsburgh, Pennsylvania

Alison M. DeWaters, DPM

Private Practice
Affiliated Foot and Ankle Center
Howell, New Jersey

Lawrence A. DiDomenico, DPM, FAFAS

Adjunct Professor
Ohio College of Podiatric Medicine
Visiting Professor
Northeast Ohio Medical University
Section Chief, Podiatric Medicine and
Surgery
St. Elizabeth's Hospital
Director, Reconstructive Rearfoot and
Ankle Surgical Fellowship
Ankle and Foot Care Centers
Youngstown, Ohio

Cornelius M. Donohue, DPM

Medical Director, Comprehensive Wound
Healing Center
Roxborough Memorial Hospital
Philadelphia, Pennsylvania

Leslie B. Dowling, DPM

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Waycross, Georgia

Michael S. Downey, DPM, FAFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Clinical Professor and Former Chairman,
Department of Surgery
Temple University School of
Podiatric Medicine
Chief, Division of Podiatric Surgery
Penn Presbyterian Medical Center
Private Practice
Ankle and Foot Medical Centers of the
Delaware Valley
Philadelphia, Pennsylvania

Jonnica S. Dozier, DPM

Staff Podiatrist
Carl Vinson Veterans Administration
Medical Center
Dublin, Georgia

Sean Patrick Dunn, DPM

Faculty
The Podiatry Institute
Attending Surgeon
DeKalb Medical Center
Decatur, Georgia
Staff Physician
Northwest Georgia Medical Center
Gainesville, Georgia
Private Practice
Oakwood, Georgia

Cameron L. Eilts, DPM

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Sports Medicine Atlantic Orthopedics
Portsmouth, New Hampshire

Lawrence M. Fallat, DPM, FAFAS

Clinical Assistant Professor
Department of Family Practice
Wayne State School of Medicine
Director, Podiatric Surgical Residency
Section Leader, Podiatry
Department of Surgery
Oakwood Hospital
Taylor, Michigan

Joseph A. Favazzo, DPM

Assistant Professor
Department of Surgery
Ohio College of Podiatric Medicine
Private Practice
Twinsburg, Ohio

Danny R. Fijalkowski, DPM

Center for Podiatric Medicine
and Surgery
Belmont Community Hospital, a Division
of Wheeling Hospital
Bellaire, Ohio

Annette D. Filiatrault, DPM, MS, FAFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Atlanta, Georgia

William D. Fishco, DPM, MS, FAFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Teaching Faculty
Maricopa Medical Center
Private Practice
Anthem, Arizona

Ryan H. Fitzgerald, DPM, AACFAS

Private Practice
Hess Orthopaedics and Sports Medicine
Harrisburg, Pennsylvania

K. Paul Flanigan, DPM, FAFAS

Private Practice
Portland Foot and Ankle
Portland, Maine

Justin J. Fleming, DPM, FAFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Chief, Foot and Ankle Service
Muscle, Bone and Joint Center
Director, Foot and Ankle Training
Aria Health System
Northwest Orthopedic Specialists
Philadelphia, Pennsylvania

Lawrence A. Ford, DPM, FAFAS

Assistant Sub-Chief, Department of
Orthopedics and Podiatric Surgery
Kaiser Permanente
Program Director
Kaiser San Francisco Bay Area Foot and
Ankle Residency
Oakland, California

Renato J. Giorgini, DPM, FACPAS, FASPS, DABPS, DABPO

Section Chief, Podiatric Surgery
Director, Podiatric Medical Education
Good Samaritan Medical Center
Professor, Division Surgical Sciences
New York College of Podiatric Medicine
Lindenhurst, New York

Tara L. Giorgini, DPM, MD

Faculty
The Podiatry Institute
Decatur, Georgia
Casa di Cura Quisisana
Rome, Italy

Robert M. Goecker, DPM, FACPAS

Faculty
The Podiatry Institute
Decatur, Georgia
Chief, Podiatric Foot and Ankle Surgery
Sarasota Memorial Hospital
Private Practice
Sarasota, Florida

Sean T. Grambart, DPM, FACPAS

Carle Physician Group
Carle Foundation Hospital
Clinical Instructor University of Illinois
School of Medicine
Champaign, Illinois

Jaymes D. Granata, MD

Private Practice
Lewis Center, Ohio

David J. Granger, DPM, FACPAS

Orthopaedic and Spine Specialists
York, Pennsylvania

Christa M. Gredlein, DPM, FACPAS

Private Practice
Baltimore, Maryland

Donald R. Green, DPM, FACPAS

Faculty
The Podiatry Institute
Decatur, Georgia
Residency Director
Scripps Mercy Kaiser Podiatric
Residency Program
San Diego, California
Clinical Professor
California School of Podiatric Medicine
Oakland, California

Jordan P. Grossman, DPM, FACPAS

Affiliate Member
The Podiatry Institute
Decatur, Georgia
Private Practice
Akron, Ohio

Mack Jay Groves IV, DPM, FACPAS

Faculty
The Podiatry Institute
Decatur, Georgia
St. Tammany Parish Hospital
Covington, Louisiana

Charles J. Gudas, DPM, FACPAS

Private Practice
Charleston, South Carolina

George S. Gumann, DPM, FACPAS

Faculty
The Podiatry Institute
Decatur, Georgia
Orthopedic Clinic
Martin Army Hospital
Fort Benning, Georgia

Todd R. Gunzy, DPM, FACPAS

Affiliate Member
The Podiatry Institute
Decatur, Georgia
Director, Pediatric Foot and Ankle Medical
Mission Program
Private Practice
Mesa, Arizona

Todd B. Haddon, DPM, FACPAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Mesa, Arizona

Patrick B. Hall, DPM

Faculty
The Podiatry Institute
Decatur, Georgia
Bone and Joint Clinic of Baton Rouge
Baton Rouge, Louisiana

Graham A. Hamilton, DPM, FACPAS

Attending Surgeon
Department of Orthopedics and
Podiatric Surgery
Kaiser San Francisco Bay Area Foot and
Ankle Residency Program
Antioch, California

Mark A. Hardy, DPM, FACPAS

Staff
Ohio Permanente Medical Group, Inc.
Director, Cleveland Clinic Kaiser
Permanente Foot and Ankle Residency
Cleveland, Ohio

Edwin J. Harris, DPM, FACPAS

Clinical Professor, Orthopaedics and
Rehabilitation
Loyola University Chicago, Stritch School
of Medicine
Chicago, Illinois

William Harris IV, DPM, AACFAS

Private Practice
Lancaster, South Carolina

Geoffrey S. Heard, DPM

Chairman, Podiatry Department
Sequoia Hospital
Redwood City, California
Private Practice
Belmont, California

John E. Herzenberg, MD, FRCSC

Director, Pediatric Orthopedics
Director, International Center for
Limb Lengthening
Director, Limb Reconstruction Fellowship
Program
Rubin Institute for Advanced Orthopedics
Sinai Hospital of Baltimore
Clinical Professor, Department of
Orthopaedics
University of Maryland School of Medicine
Baltimore, Maryland

Gina A. Hild, DPM

PGY III
Kaiser Permanente, Cleveland Clinic
Foundation
Cleveland, Ohio

Linda Ho, DPM

Private Practice
Loma Linda, California

Claire A. Hollstrom, DPM

Diplomate, American Board of
Podiatric Surgery
Private Practice
Ankle and Foot Center of Georgia
LaGrange, Georgia

Jacob A. Hord, DPM, AACFAS

Faculty
Jewish Hospital Podiatry Residency
Program
Louisville, Kentucky
Private Practice
Shelbyville, Kentucky

Zeeshan S. Husain, DPM, FACPAS

Assistant Residency Director
Podiatric Medicine and Surgery
Residency
Detroit Medical Center
Detroit, Michigan

Byron L. Hutchinson, DPM, FACPAS

Program Director, Foot and
Ankle Institute
St. Francis Hospital
Federal Way, Washington
Private Practice
Burien, Washington

Christopher F. Hyer, DPM, MS, FACFAS

Fellowship Co-Director
Advanced Foot and Ankle Surgical
Fellowship
Orthopedic Foot and Ankle Center
Westerville, Ohio

Keith L. Jacobson, DPM, FACFAS

Committee Member
Highlands-Presbyterian St. Luke's
Residency Program
Advanced Orthopedic and Sports Medicine
Specialists
Denver, Colorado

Meagan M. Jennings, DPM, FACFAS

Department of Orthopedics and Podiatry
Palo Alto Medical Foundation
Chief of Podiatry
El Camino Hospital
Mountain View, California

A. Louis Jimenez, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Program Director, Atlanta VAMC Podiatric
Residency Program
Past President, American College Foot and
Ankle Surgeons
Private Practice
Gwinnett Foot, Ankle Leg Centers
Snellville, Georgia

Shine John, DPM, AACFAS

Foot Specialists
Cedar Park, Texas

Warren S. Joseph, DPM, FIDSA

Consultant
Lower Extremity Infectious Diseases
Roxborough Memorial Hospital
Philadelphia, Pennsylvania

Molly A. Judge, DPM, FACFAS

Director, Publications and Research
Podiatric Residency Program
Cleveland Clinic Foundation-Kaiser
Permanente Foundation
Cleveland, Ohio
Adjunct Faculty
Ohio University and Colleges of
Podiatric Medicine
Faculty
Graduate Medical Education
Mercy Health Partners
Private Practice
Toledo, Ohio

Carl A. Kihm, DPM

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Douglasville, Georgia

Paul J. Kim, DPM, FACFAS

Associate Professor, Department of
Plastic Surgery
Division of Wound Healing and Hyperbaric
Medicine
Georgetown University Hospital
Washington, District of Columbia

Tracy L. Klimaz, DPM, AACFAS

Private Practice
Virginia Beach, Virginia

Constantine S. Kokenes, MD

Department of Anesthesiology
DeKalb Medical Center
Decatur, Georgia

Mark A. Kosinski, DPM, FIDSA

Professor, Department of Medical
Sciences
New York College of Podiatric Medicine
New York, New York
Instructor, Department of Surgery
New York Medical College
Valhalla, New York

Bradley M. Lamm, DPM, FACFAS

Head of Foot and Ankle Surgery
International Center for
Limb Lengthening
Director, Foot and Ankle Deformity
Correction Fellowship
Rubin Institute for Advanced
Orthopedics
Sinai Hospital
Baltimore, Maryland

Adam S. Landsman, DPM, PhD, FACFAS

Assistant Professor of Surgery
Harvard Medical School
Chief, Division of Podiatric Surgery
Cambridge Health Alliance
Cambridge, Massachusetts

Stephan J. LaPointe, DPM, PhD, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Rome, Georgia

Gretchen A. Lawrence, DPM, AACFAS

Private Practice
Waynesville, North Carolina

Michael S. Lee, DPM, FACFAS

Adjunct Clinical Professor
Des Moines University
Past President
American College of Foot and
Ankle Surgeons
Private Practice
Capital Orthopaedics and Sports
Medicine, PC
Clive, Iowa

George T. Liu, DPM, FACFAS

Assistant Professor
Department of Orthopaedic Surgery
University of Texas Southwestern
Medical Center
Parkland Memorial Hospital Level I
Trauma Center
Dallas, Texas

Kieran T. Mahan, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Associate Dean for Academic Affairs
Chair and Professor, Department of
Podiatric Surgery
Temple University School of
Podiatric Medicine
Philadelphia, Pennsylvania

D. Scot Malay, DPM, MSCE, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Director of Podiatric Research and
Staff Surgeon
Penn Presbyterian Medical Center
Private Practice
Ankle and Foot Medical Centers of the
Delaware Valley
Philadelphia, Pennsylvania

Dennis E. Martin, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
North Charleston, South Carolina

Suhail B. Masadeh, DPM, FACFAS

Faculty
American Health Network Fellowship
Advanced Reconstructive Foot and
Ankle Surgery
Private Practice
Muncie, Indiana

Michael P. Maskill, DPM

Orthopaedic Associates of Kalamazoo
Department of Foot and Ankle Surgery
Kalamazoo, Michigan

E. Dalton McGlamry, DPM, DSc (Hon), DHL

Founding Member
The Podiatry Institute
Decatur, Georgia

Michael C. McGlamry, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Cumming, Georgia

**Robert W. Mendicino, DPM,
FACFAS**

Foot and Ankle Surgery
Pinnacle Orthopedic Associates
Salisbury, North Carolina

**Allison J.A. Menke, DPM,
AACFAS**

Faculty
The Podiatry Institute
Decatur, Georgia
Attending Surgeon
DeKalb Medical Center
Decatur, Georgia

**Thomas J. Merrill, DPM,
FACFAS**

Faculty
The Podiatry Institute
Decatur, Georgia
Professor of Surgery
Barry University School of
Podiatric Medicine
Miami Shores, Florida
Residency Director
Mercy Hospital
Miami, Florida

**Amanda Meszaros, DPM,
FACFAS**

Co-Chair, Department of Surgery
Mercy Allen Hospital
Private Practice
Oberlin, Ohio

Justin T. Meyer, DPM

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Santa Barbara, California

Andrew J. Meyr, DPM, AACFAS

Assistant Professor, Department of
Podiatric Surgery
Temple University School of
Podiatric Medicine
Philadelphia, Pennsylvania

J. Michael Miller, DPM, FACFAS

Director of Fellowship Training
Foot and Ankle Reconstructive
Surgical Service
American Health Network
Indianapolis, Indiana

Stephen J. Miller, DPM

Faculty
The Podiatry Institute
Decatur, Georgia
Anacortes, Washington

Hilaree B. Milliron, DPM

Private Practice
Jacksonville Beach, Florida

**William G. Montross, DPM,
FACFAS**

Attending Physician
Denver Veterans Administration Hospital
Podiatric Residency
Denver, Colorado
Assistant Clinical Professor
Rocky Vista Osteopathic College
Parker, Colorado

Jared L. Moon, DPM

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Chicago, Illinois

**James H. Morgan Jr, DPM,
FACFAS, FAAPSM**

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Mobile, Alabama

**Robb A. Mothershed, DPM,
FACFAS**

Faculty
The Podiatry Institute
Decatur, Georgia
AO Alumnus
Department of Orthopedics
University of Washington
Seattle, Washington
Private Practice
Winston-Salem, North Carolina

**Travis A. Motley, DPM, MS,
FACFAS**

Associate Professor
Department of Orthopaedic Surgery
Bone and Joint Institute
University of North Texas Health
Science Center
Fort Worth, Texas

Aprajita Nakra, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Phoenix and Gilbert, Arizona

Alan Ng, DPM, FACFAS

Advanced Orthopedic and Sports
Medicine Specialists
Residency Committee Highlands/
Presbyterian St. Luke's Medical Center
Denver, Colorado

Lawrence M. Oloff, DPM

Diplomate, American Board of
Podiatric Surgery
Sports Orthopedic and Rehabilitation
(SOAR) Medical Group
Redwood City, California

Lawrence S. Osher, DPM

Professor, Department of
Podiatric Medicine
Ohio College of Podiatric Medicine
Independence, Ohio

Kittra T. Owens, DPM

Division Officer, Department of
Orthopedics
Naval Hospital
Camp Lejeune, North Carolina

**Charles F. Peebles, DPM,
FACFAS**

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Atlanta, Georgia

Jorge G. Penagos Vasquez, MD

Chief, Department of Orthopaedic Surgery
and Foot and Ankle
Pediatric Foundation of Guatemala City
Guatemala City, Guatemala

Keith D. Pfeifer, DPM

Assistant Residency Director
Eisenhower Army Medical Center
Fort Gordon, Georgia

Jane Pontious, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Chair, Department of Surgery
Assistant Dean of Clinical Education
Temple University School of
Podiatric Medicine
Philadelphia, Pennsylvania

Donald R. Powell, DPM

Faculty
The Podiatry Institute
Attending Surgeon
DeKalb Medical Center
Decatur, Georgia

**Linnie V. Rabjohn, DPM,
FACFAS**

Private Practice
Arlington/Mansfield Foot and
Ankle Centers
Arlington, Texas

Johanna-Marie Richey, DPM, BBS

Chief Resident
Kaiser San Francisco Bay Area Foot and
Ankle
San Francisco, California

Thomas S. Roukis, DPM, PhD, FACFAS

Department of Orthopaedics
Podiatry and Sports Medicine
Gundersen Lutheran Medical Center
La Crosse, Wisconsin

John A. Ruch, DPM, FACFAS

Director of Medical Education
The Podiatry Institute
Attending Surgeon
DeKalb Medical Center
Decatur, Georgia
Private Practice
Village Podiatry Centers
Tucker, Georgia

Shannon M. Rush, DPM, FACFAS

Director, Silicon Valley Foot and
Ankle Fellowship
Palo Alto Medical Foundation
Mountain View, California

Jay D. Ryan, DPM, AACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Staff Physician
Inova Fairfax Hospital
Fairfax, Virginia

John M. Schuberth, DPM

Faculty
The Podiatry Institute
Decatur, Georgia
Chief, Foot and Ankle Surgery
Department of Orthopedic Surgery
Kaiser Foundation Hospital
San Francisco, California

Jaclyn M. Schwartz, DPM

Senior Resident
DeKalb Medical Center
Decatur, Georgia

Thomas F. Smith, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Chairman, Podiatry Section
University Hospital
Podiatry Staff
Charlie Norwood VAMC
Augusta, Georgia
Consultant
Eisenhower Army Medical Center
Fort Gordon, Georgia

Joe T. Southerland, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Arlington/Mansfield Foot and
Ankle Centers
Arlington, Texas

Sarah A. Spizzirri, DPM, AACFAS

Private Practice
Christie Clinic
Champaign, Illinois

John J. Stapleton, DPM, FACFAS

Foot and Ankle Surgery
VSAS Orthopaedics
Chief of Podiatric Surgery
Leigh Valley Hospital
Allentown, Pennsylvania
Clinical Assistant Professor of Surgery
Penn State College of Medicine
Hershey, Pennsylvania

Jerome K. Steck, DPM, FACFAS

Private Practice
Southern Arizona Orthopedics
Tucson, Arizona

Dawn Y. Stein, DPM, CWS

Department of Podiatry
Grove City Medical Center
Grove City, Pennsylvania

John S. Steinberg, DPM, FACFAS

Associate Professor
Department of Plastic Surgery
Georgetown University School
of Medicine
Program Director
MedStar Washington Hospital Center
Podiatric Residency
Co-Director, Center for Wound Healing
MedStar Georgetown University Hospital
Washington, District of Columbia

John J. Stienstra, DPM, FACFAS

Department of Orthopedics
The Permanente Medical Group
Union City, California

Tod R. Storm, DPM, FACFAS

Active Staff
Bozeman Deaconess Hospital
Bozeman, Montana

Robert P. Taylor, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Adjunct Faculty
Department of Medicine
Baylor Medical Center
Garland, Texas
Private Practice
Frisco, Texas

James L. Thomas, DPM, FACFAS

Chief, Division of Foot and Ankle
Department of Orthopaedic Surgery
University of Florida
Jacksonville, Florida

Marija Ugrinich, DPM, AACFAS

Staff Surgeon
Penn Presbyterian Medical Center
Private Practice
Ankle and Foot Medical Centers of the
Delaware Valley
Philadelphia, Pennsylvania

John V. Vanore, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Gadsden, Alabama

Harold W. Vogler, DPM, FACFAS

Past Chairman, Department of Surgery
Pennsylvania College of
Podiatric Medicine
Philadelphia, Pennsylvania
Past Chairman, Section of Foot and
Ankle Surgery
Sarasota Memorial Hospital
Partner and Fellowship Director
Sarasota Orthopedic Associates
Sarasota, Florida

Carl R. Wagreich, DPM

Associate Clinical Professor
University of Southern California
Los Angeles, California
Residency Director
HealthSouth Surgery Center of South Bay/
Baja Project Surgical Residency Program
Torrance, California
Co-Director, Baja Project for
Crippled Children
Mexicali, Mexico

George F. Wallace, DPM, FACFAS

Director, Podiatry Service
Medical Director, Ambulatory Care Services
University Hospital
University of Medicine and Dentistry of
New Jersey
Newark, New Jersey

Mari Wargo-Dorsey, DPM, AACFAS

Private Practice
The Ankle and Foot Care Centers
Boardman, Ohio

R. David Warren, DPM, FACFAS

Private Practice
Arlington, Texas

Steven A. Weiskopf, DPM, FACFAS

Faculty
The Podiatry Institute
Decatur, Georgia
Private Practice
Woodstock, Georgia

Mitzi L. Williams, DPM, FACFAS

Young Affiliate Member
The Podiatry Institute
Decatur, Georgia
Attending Surgeon
San Francisco Bay Area Foot and Ankle
Residency Program
Department of Orthopedics and
Podiatric Surgery
Kaiser Permanente Hospital
Oakland, California

Jason J. Willis, DPM, AACFAS

Attending Podiatrist
Foot Centers of Texas
Methodist Sugar Land Hospital
Sugar Land, Texas

Jon M. Wilson Jr, DPM, AACFAS

Department of Surgery
St. Tammany Parish Hospital
Lakeview Regional Medical Center
Covington, Louisiana

Robyn Winner, DPM

Private Practice
Seattle, Washington

Daniel J. Yarmel, DPM, AACFAS, AAPWCA

Private Practice and Attending Faculty
Pinnacle Health Hospitals
Harrisburg, Pennsylvania

Thomas M. Zgonis, DPM, FACFAS

Associate Professor, Department of
Orthopaedics
Division Chief, Externship
Fellowship Program Director
University of Texas Health Science Center
San Antonio, Texas

Richard J. Zirm, DPM

Faculty
The Podiatry Institute
Decatur, Georgia
Department of Surgery
Southwest General Health Center
Private Practice
Cleveland, Ohio

Foreword

The fourth edition of *McGlamry's Comprehensive Textbook of Foot and Ankle Surgery* has been written to meet the current need for a comprehensive work on foot and ankle surgery, not only for podiatric surgeons but also for orthopaedic foot and ankle surgeons, who are making valuable contributions to this field.

Foot and ankle surgery has evolved at a rapid pace over the past 30 years. Not until an understanding of foot and ankle biomechanics and the principles of AO-ASIF were materially refined was this surgery practiced with precision. Prior to that time, functional arthroplasty and fusion dominated the field. Orthopaedic companies assisted in that revolution with the development of unique designs of internal and external fixation that brought the surgical results into a functional cure rather than a palliative "fix."

In concert with this revolution, E. Dalton McGlamry, DPM, founded the Podiatry Institute in Atlanta and soon thereafter edited the text *Fundamentals of Foot Surgery* and the first edition of *The Comprehensive Textbook of Foot Surgery*. Dr. McGlamry was a great inspiration to all podiatric surgeons, and his legacy has been carried on by many of his residents and colleagues.

This two-volume edition of *McGlamry's Comprehensive Textbook of Foot and Ankle Surgery*, edited by Joe T. Southerland, DPM, and assisted by 151 authors, consists of 117 chapters and more than 1,900 pages and is worthy of comparison with *Campbell's Operative Orthopedics*. Virtually every aspect of foot and ankle surgery has been covered, from ingrown nails to total ankle arthroplasty and hybrid external fixation.

To overcome the widespread conception of foot and ankle surgery as a purely mechanical equation, an effort is made in the first section of this text to correlate the technical principles used in this subspecialty. This is followed by a section on

perioperative management, which includes the various aspects that one encounters in foot and ankle surgery. The next 50 chapters follow guidelines of anatomical sites where foot and ankle surgery is performed, beginning with nail surgery and concluding with midfoot and hindfoot arthrodesis. The section on first ray, hallux abducto valgus, and related deformities is especially noteworthy, with 14 chapters on the subject covering virtually every aspect of contemporary correction of bunion deformities and their complications. This is true as well for the section on trauma, with 18 comprehensive chapters on the subject.

This book is designed to be a user-friendly and clinically relevant text on common foot and ankle surgery procedures. As the discipline becomes more and more sophisticated, it is obvious that the technical component of operative intervention is critical to clinical success or failure. Therefore, there continues to be an important need to understand the technical aspects of foot and ankle surgery. Many pearls of wisdom are detailed by the authors in order to deal with the multiple potential pitfalls seen in patients with complex foot and ankle deformities.

I have often said that "surgery is both a science and an art, but foot and ankle surgery may be more art than science." This text should prove to be the resource of choice for modern foot and ankle surgery care over the next several years. It will serve those who are novices in the field who wish to concentrate on principles, those experienced surgeons who wish to fine-tune their approach, and everyone in between.

Lowell Scott Weil, Sr, DPM
Weil Foot and Ankle Institute
Des Plaines, Illinois

Preface

It is with great pleasure that we present the fourth edition of McGlamry's *Comprehensive Textbook of Foot and Ankle Surgery*. The goal of this text, as always, is to help students build a good foundation, to help residents develop their skills, and to help surgeons hone their technique.

Like the three previous editions, this book encompasses all facets of foot and ankle surgery. This edition, however, places greater emphasis on an instructional approach so as to better help the surgeon, resident, or student see how the procedures are done. It has been completely reorganized to present content in a more logical fashion. Divided into 12 parts across 2 volumes, it begins with basics such as biomaterials and pain management and moves through anatomic locations, physiologic conditions, special surgery, tumors, and trauma. This fourth edition has dozens more chapters and contributors than earlier volumes, making it the most truly comprehensive *Comprehensive Textbook* so far. In addition, for the first time, the

textbook has been printed in full color throughout, greatly clarifying the appearance of disorders, diagnostic signs, and surgical landmarks and bringing the operative steps to life.

As the lead editor, I extend my gratitude to the section editors for their work in helping make this a reality. However, most appreciated are the authors, without whom a book of this sort cannot exist. Amid the responsibilities of practice, teaching, and family lives, they were able to find the time needed to write these chapters. Unfortunately, this edition is missing one esteemed author, Gerard V. Yu, who passed away unexpectedly in 2005.

It has been a several-year journey since we started work on this book, and I am very proud to be a part of it. It is my hope that it delivers what we set out to do.

Joe T. Southerland, DPM, FACFAS

Introduction

As the director of Medical Education of the Podiatry Institute, I am proud to provide the Introduction for the fourth edition of McGlamry's *Comprehensive Textbook of Foot and Ankle Surgery*.

This textbook is the ongoing testament to the life passion of E. Dalton McGlamry, DPM. This ambitious project was conceived 30 years ago under the direction of Dr. McGlamry. The supporting staff included graduates of the original Doctor's Hospital Podiatric Residency and many other highly talented and dedicated educators in the podiatric profession.

The first edition, called simply *Comprehensive Textbook of Foot Surgery*, took several years to compile and edit and was published in 1987. It could not have been completed without the tireless support of Dalton's wife, Becky, who served the unenviable roll as authors' editor. The second edition was produced in 1992 under the guidance of editors Dalton McGlamry, Alan Banks, and Michael Downey. The third edition was released in 2001 with Alan Banks, Michael Downey, Dennis Martin, and Steve Miller serving as editors. You now hold the fourth edition. Our many thanks are owed to editors Joe Southerland, Jeffrey Boberg, Michael Downey, Aprajita Nakra, and Linnie Rabjohn for their countless hours of work.

Anyone who has attempted to produce a scientific paper knows the many hours of commitment and effort that are

necessary to complete even a single article. That the dedicated faculty of the Podiatry Institute have stuck together for over 40 years and overseen the publication of a major textbook on foot and ankle surgery through four editions is a remarkable feat. One of our dearest members, the late Gerard Vincent Yu, deserves special mention. His many contributions to podiatric education, his drive and energy, his integrity, his love of the profession, and his commitment to colleagues and friends have inspired and always will inspire us.

The contributing authors for this textbook throughout its lifespan so far are too many to mention individually, but without each and every one of them those editions could not have been completed. I would like to recognize and salute each of the individuals who once again have sacrificed their personal time and energy to perpetuate this information.

The completion of this edition of McGlamry's *Comprehensive Textbook of Foot and Ankle Surgery* could not have been possible without the tireless efforts of Mr. Dan Vickers, the executive director of the Podiatry Institute. It has been Dan's commitment and support to the project, to the institute, and to each of us that has kept us on track to reach our goal once again.

John A. Ruch, DPM

Contents

| | |
|----------------------|-------|
| Contributing Authors | x |
| Foreword | xvii |
| Preface | xviii |
| Introduction | xix |

VOLUME ONE

PART I: BASICS

SECTION I: Technical Principles

- 1 **Instrumentation** 3
D. SCOT MALAY AND ROBYN WINNER
- 2 **Biomaterials: Metals and Other Nonabsorbables** 15
SEAN T. GRAMBART AND JEFFREY C. CHRISTENSEN
- 3 **Absorbable Biomaterials** 24
ADAM S. LANDSMAN
- 4 **Suture Materials and Needles** 37
DANNY R. FIJALKOWSKI

SECTION II: Perioperative Management

- 5 **Perioperative Evaluation** 54
LOPA DALMIA AND ANDREA D. CASS
- 6 **Local Anesthetics** 63
MITZI L. WILLIAMS AND DONALD R. GREEN
- 7 **General and Regional Anesthesia** . . . 73
CONSTANTINE S. KOKENES, JAY D. RYAN,
ALLISON J.A. MENKE, AND DONALD R. POWELL
- 8 **Perioperative Pain Management** . . . 83
ANDREW J. MEYR AND JOHN S. STEINBERG
- 9 **Perioperative Prophylaxis for Deep Vein Thrombosis** 97
JAMES H. MORGAN, JR
- 10 **Perioperative Antibiotics** 101
AMANDA MESZAROS

PART II: FOREFOOT SURGERY

SECTION I: Nail Surgery

- 11 **Nail Surgery** 109
TIMOTHY W. CRISLIP AND JEFFREY S. BOBERG

SECTION II: Morton Neuroma

- 12 **Interdigital Neuroma (Morton Neuroma)** 117
JEFFREY S. BOBERG AND CAMERON L. EILTS

SECTION III: Digital Deformity

- 13 **Lesser Digital Deformities: Etiology, Procedural Selection, and Arthroplasty** 124
JEFFREY S. BOBERG AND JASON J. WILLIS
- 14 **Digital Surgery: Metatarsophalangeal Joint Release and Proximal Interphalangeal Joint Arthrodesis** . . 129
ANDREA D. CASS AND JOHN A. RUCH
- 15 **Flail Toe with Bone Graft** 140
KIERAN T. MAHAN
- 16 **Flexor Digitorum Longus Tendon Transfer** 145
ANNETTE D. FILIATRAULT, JOHN A. RUCH,
AND STEVEN A. WEISKOPF
- 17 **Congenital Overlapping Fifth Toe Deformity** 154
MICHAEL S. DOWNEY AND JON M. WILSON, JR
- 18 **Surgical Repair of Fifth Digit Deformities** 165
THOMAS F. SMITH, CARL A. KIHM,
AND KEITH D. PFEIFER

SECTION IV: Lesser Metatarsophalangeal Joint Deformities

- 19 Plantar Plate Repair of the Second Metatarsophalangeal Joint** 187
CRAIG A. CAMASTA
- 20 Transverse Plane Digital Deformities** 202
MICHAEL S. DOWNEY, MICHAEL C. McGLAMRY, AND SARAH A. SPIZZIRRI
- 21 The Weil Lesser Metatarsal Osteotomy** 224
RICHARD J. ZIRM
- 22 Central Rays: V Osteotomy, DFWO, Condylectomy** 229
WILLIAM D. FISHCO AND JEFFREY S. BOBERG
- 23 Tailor's Bunion Deformity** 235
SEAN PATRICK DUNN AND JANE PONTIOUS

PART III: FIRST RAY, HALLUX ABDUCTO VALGUS, AND RELATED DEFORMITIES

- 24 Evaluation and Procedural Selection in Hallux Valgus Surgery** 245
JEFFREY S. BOBERG
- 25 Anatomic Dissection of the First Metatarsophalangeal Joint for Hallux Valgus Surgery** 250
JOHN A. RUCH, CHARLES F. PEEBLES, AND CLAIRE A. HOLLSTROM
- 26 Hallux Osteotomies** 260
THOMAS F. SMITH AND JARED L. MOON
- 27 Distal Metaphyseal Osteotomies in Hallux Abducto Valgus Surgery** ... 279
THOMAS A. BROSKE II AND PATRICK B. HALL
- 28 Proximal Osteotomies of the First Metatarsal** 290
ROBB A. MOTHERSHED
- 29 Offset-V Osteotomy of the First Metatarsal Shaft in Hallux Abducto Valgus** 302
GARY R. BAUER AND HAROLD W. VOGLER
- 30 Z-Scarf Osteotomy** 314
CHARLES J. GUDAS

- 31 Lapidus Bunionectomy: First Metatarsal–Cuneiform Arthrodesis** 322
LAWRENCE A. DiDOMENICO AND MARI WARGO-DORSEY
- 32 Juvenile Hallux Abducto Valgus Deformity** 331
DONALD R. GREEN, KIERAN T. MAHAN, AND TRACY L. KLIMAZ
- 33 Joint Salvage and Preservation Surgical Techniques for Hallux Limitus** 343
ANNALISA Y. CO, THOMAS J. CHANG, AND CRAIG A. CAMASTA
- 34 First Metatarsophalangeal Joint Arthroplasty** 362
JOHN V. VANORE, WILLIAM G. MONTROSS, A. LOUIS JIMENEZ, AND JONNICA S. DOZIER
- 35 First Metatarsophalangeal Joint Arthrodesis** 400
THOMAS F. SMITH AND ALLISON J.A. MENKE
- 36 Complications in Hallux Abducto Valgus Surgery (Excluding Hallux Varus)** 417
MOLLY A. JUDGE
- 37 Hallux Varus** 461
MOLLY A. JUDGE

PART IV: REARFOOT

SECTION I: Midfoot and Heel Surgery

- 38 Common Pedal Prominences** 471
THOMAS F. SMITH AND LESLIE B. DOWLING
- 39 Plantar Heel** 494
JEFFREY S. BOBERG, DAMIEN M. DAUPHINÉE, D. SCOT MALAY, AND WILLIAM HARRIS IV
- 40 The Distal Tarsal Tunnel: First Branch of the Lateral Plantar Nerve Release** 505
ROBERT M. GOECKER
- 41 Plantar Foot Surgery** 513
J. MICHAEL MILLER AND SUHAIL B. MASADEH
- 42 Pes Cavus Surgery** 525
CRAIG A. CAMASTA AND ANDREA D. CASS

SECTION II: Valgus Foot Deformity

- 43 Ankle Equinus 541**
MICHAEL S. DOWNEY AND JACLYN M. SCHWARTZ
- 44 Flexible Valgus Deformity 585**
KIERAN T. MAHAN AND K. PAUL FLANIGAN
- 45 Tarsal Coalition 598**
MICHAEL S. DOWNEY AND ALISON M. DeWATERS
- 46 Posterior Tibial Tendon Dysfunction 636**
ALAN R. CATANZARITI, ROBERT W. MENDICINO,
AND MICHAEL P. MASKILL
- 47 Medial Column Fusion. 670**
THOMAS J. CHANG
- 48 Arthroereisis 675**
DONALD R. GREEN AND MITZI L. WILLIAMS

PART V: ANKLE

- 49 Os Trigonum Surgery 691**
MOLLY A. JUDGE
- 50 Acute Ankle Conditions 702**
MARK A. HARDY AND GINA A. HILD
- 51 Old Syndesmotic Injuries 710**
BRIAN B. CARPENTER AND TRAVIS A. MOTLEY
- 52 Ankle Replacement Arthroplasty .. 717**
JOHN M. SCHUBERTH, JEROME K. STECK,
AND JEFFREY C. CHRISTENSEN
- 53 Arthroscopy of the Ankle and Foot 757**
JEFFREY C. CHRISTENSEN, MEAGAN M. JENNINGS,
AND JOHN J. STIENSTRA
- 54 Osteochondroses of the Foot and Ankle 780**
LAWRENCE M. FALLAT,
JEFFREY C. CHRISTENSEN, AND
JACOB A. HORD

PART VI: MIDFOOT JOINT ARTHRODESIS

- 55 Principles of Arthrodesis 803**
SEAN PATRICK DUNN, JUSTIN T. MEYER,
AND JOHN A. RUCH

- 56 Tarsometatarsal Arthrodesis 810**
SHINE JOHN, ALAN R. CATANZARITI,
AND ROBERT W. MENDICINO
- 57 Trephine Arthrodesis at the Midfoot 820**
ANNETTE D. FILIATRAULT
- 58 Triple Arthrodesis 824**
JOHN A. RUCH, LOPA DALMIA,
AND PATRICK B. HALL
- 59 Subtalar Joint Arthrodesis 843**
MARK A. HARDY
- 60 Talonavicular Fusions. 851**
WILLIAM D. FISHCO
- 61 Pantalar Arthrodesis 855**
TRAVIS A. MOTLEY AND BRIAN B. CARPENTER

VOLUME TWO

PART VII: SPECIAL SURGERY: CONDITIONS

SECTION I: Rheumatoid Foot and Ankle

- 62 Rheumatoid Rearfoot. 863**
LINNIE V. RABJOHN AND DANIEL J. YARMEL
- 63 Pan Metatarsal Head Resection ... 876**
DENNIS E. MARTIN

SECTION II: Neurologic Disorders

- 64 Spasticity and Paralytic Disorders 884**
R. DAVID WARREN
- 65 Charcot-Marie-Tooth Disease. 892**
ROBERT M. GOECKER, ALAN S. BANKS,
MICHAEL S. DOWNEY, AND RICHARD J. ZIRM

SECTION III: Peripheral Nerve Surgery

- 66 General Entrapment Syndromes... 912**
D. SCOT MALAY, E. DALTON McGLAMRY,
AND MARIJA UGRINICH
- 67 Tarsal Tunnel Syndrome 934**
MICHAEL S. DOWNEY AND DANIEL J. YARMEL