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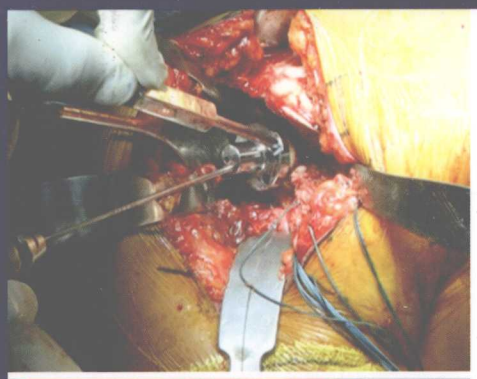

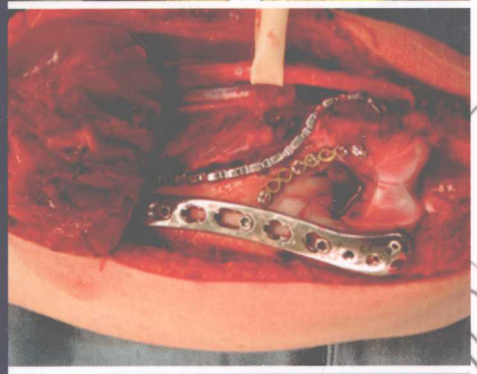

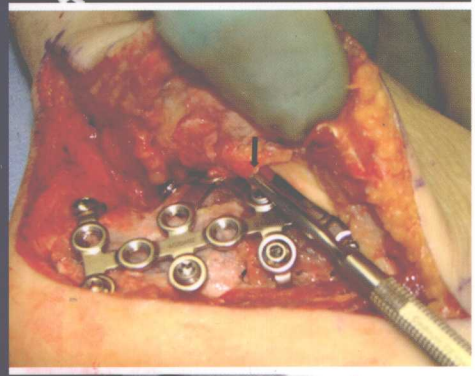

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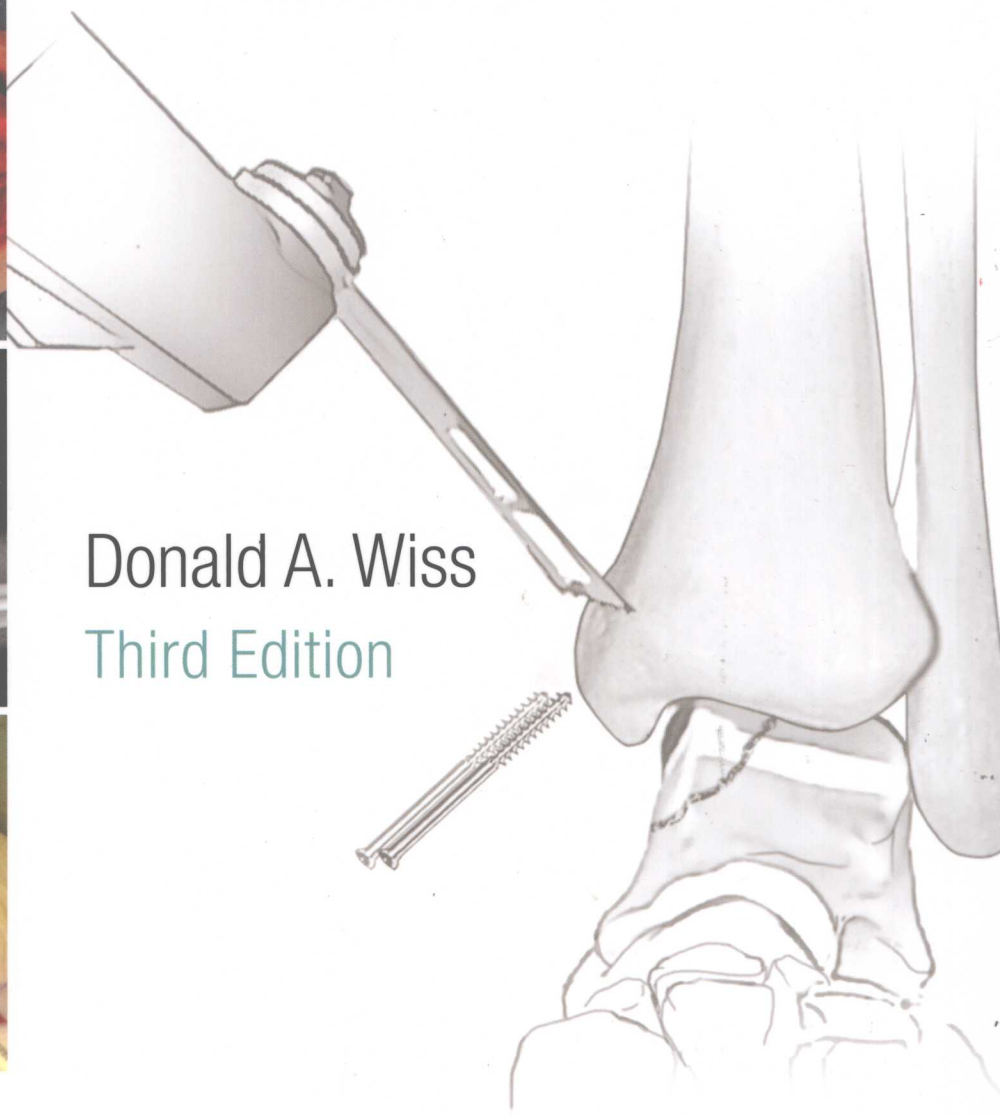

Donald A. Wiss

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Master Techniques in Orthopaedic Surgery®

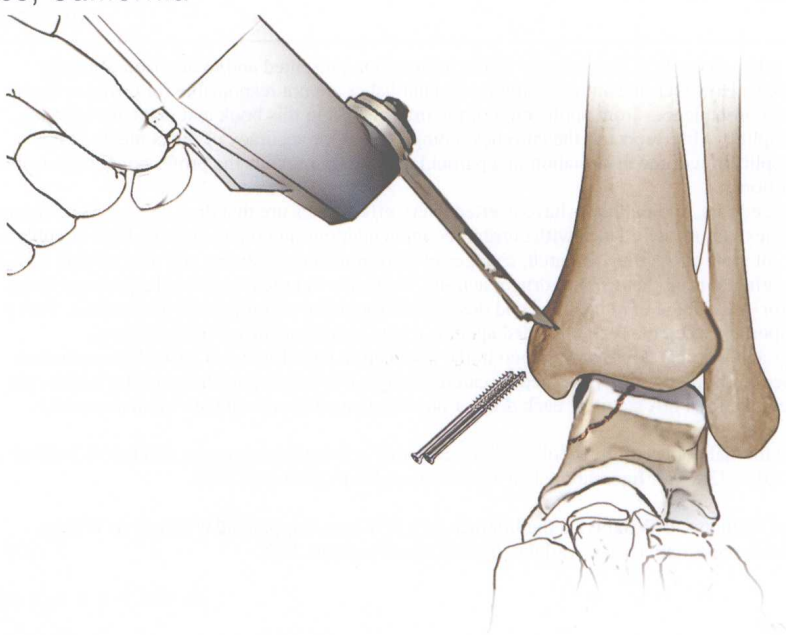
Fractures

Third Edition

EDITOR

Donald A. Wiss, MD

Director of Orthopaedic Trauma
Cedars-Sinai Medical Center
Los Angeles, California



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To My Beloved Mother
Dorothy Zuckerman Wiss
Who Passed Away As This Book Was Going To Press
A lasting bond, a quiet trust, a feeling like no other.
A gratitude that fills the heart,
A son's love for his mother.

Contributors

Amr A. Abdelgawad, M.D.
Assistant Professor
Department of Orthopaedic Surgery and Rehabilitation
Texas Tech University Health Sciences Center in El Paso
El Paso, Texas

David P. Barei, M.D., F.R.C.S.C.
Associate Professor
Department of Orthopaedic Surgery
University of Washington
Orthopaedic Traumatology
Harborview Medical Center
Seattle, Washington

Craig S. Bartlett III, M.D.
Associate Professor of Orthopaedics
Medical Director of Orthopaedic Trauma
The University of Vermont
Burlington, Vermont

Andrea S. Bauer, M.D.
Orthopaedic Surgeon
Orthopaedic Hand and Upper Extremity Service
Massachusetts General Hospital
Boston, Massachusetts

Michael R. Baumgaertner, M.D.
Professor
Department of Orthopaedics and Rehabilitation
Yale University School of Medicine
Chief, Orthopaedic Trauma Service
Yale—New Haven Hospital
New Haven, Connecticut

Daphne M. Beingessner, B.Math, B.Sc., M.Sc., M.D., F.R.C.S.C.
Associate Professor
Department of Orthopaedics
University of Washington
Orthopaedic Traumatology
Harborview Medical Center
Seattle, Washington

Michael J. Beltran, M.D.
Chief Resident
Orthopaedic Surgery
San Antonio Military Medical Center
San Antonio, Texas

Stephen K. Benirschke, M.D.
Professor
Department of Orthopaedics
University of Washington
Harborview Medical Center
Seattle, Washington

Pascal Boileau, M.D.
Head
Department of Orthopaedics
Department of Orthopaedics and Sports Traumatology
University of Nice-Sophia-Antipolis
Nice, France

Sreevathsa Boraiah, M.D.
Westchester Medical Center
Valhalla, New York

Matthew R. Camuso, M.D.
Orthopaedic Trauma and Fracture Care
Maine Medical Center
Portland, Maine

Kyle F. Chun, M.D.
Resident
Department of Orthopaedics and Sports Medicine
University of Washington
Harborview Medical Center
Seattle, Washington

Michael P. Clare, M.D.
Director of Fellowship Education
Foot and Ankle Fellowship
Florida Orthopaedic Institute
Tampa, Florida

Sumant G. Krishnan, M.D.
Director
Shoulder Fellowship
Baylor University Medical Center
Attending Orthopaedic Surgeon
Shoulder Service
The Carrell Clinic
Dallas, Texas

Erik Noble Kubiak, M.D.
Assistant Professor
Department of Orthopaedics
University of Utah
Salt Lake City, Utah

Lionel E. Lazaro, M.D.
Orthopaedic Surgeon
Orthopaedic Trauma Service
Weill Medical College of Cornell University
Hospital for Special Surgery and New York-Presbyterian Hospital
New York, New York

Mark A. Lee, M.D.
Associate Professor
Department of Orthopaedic Surgery
Director
Orthopaedic Trauma Fellowship
University of California, Davis
Sacramento, California

Ross Leighton, M.D.
Professor of Surgery
QEII Health Sciences Centre
Dalhousie University
Halifax, Nova Scotia, Canada

Wai-Yee Li, M.D., Ph.D.
Plastic Surgical Resident
University of Southern California
Los Angeles, California

Dean G. Lorich, M.D.
Chief
Department of Orthopaedics at New York-Presbyterian
Associate Director
Orthopaedic Trauma Service at Hospital for Special Surgery
Associate Professor of Orthopaedic Surgery
Weill Cornell Medical Center
New York, New York

Jason A. Lowe, M.D.
Assistant Professor
Orthopaedic Trauma Surgery
Director
Fragility Fracture Program
Department of Orthopaedic Surgery
University of Alabama at Birmingham
Birmingham, Alabama

Arthur L. Malkani, M.D.
Orthopaedic Trauma Surgeon
Chief of Adult Reconstruction Service
Professor of Orthopaedic Surgery
Department of Orthopaedics
University of Louisville School of Medicine
Department of Orthopaedic Surgery
The University of Louisville
Louisville, Kentucky

Joel M. Matta, M.D.
Founder and Director
Hip and Pelvis Institute at St. John's Health Center
Santa Monica, California

Elaine Mau, M.D., M.Sc.
Resident
Division of Orthopaedic Surgery
University of Toronto
St. Michael's Hospital
Toronto, Ontario, Canada

Michael D. McKee, M.D. F.R.C.S. (C)
Professor of Orthopaedic Surgery
Division of Orthopaedic Surgery
University of Toronto
St. Michael's Hospital
Toronto, Ontario, Canada

Berton R. Moed, M.D.
Professor and Chairman
Department of Orthopaedic Surgery
Saint Louis University School of Medicine
Saint Louis, Missouri

Steven J. Morgan, M.D.
Mountain Orthopaedic Trauma Surgeons
Swedish Medical Center
Englewood, Colorado

Rafael Neiman, M.D.
Co-director
Orthopaedic Trauma Surgeons of Northern California
Roseville, California

Xavier Ohl, M.D.
Orthopaedic Surgeon
Department of Orthopaedics and Sports Traumatology
L'Archet 2 Hospital
Nice, France

Robert F. Ostrum, M.D.
Director of Orthopaedic Trauma
Cooper University Hospital
Professor
Department of Surgery
Cooper Medical School of Rowan University
Camden, New Jersey

Benjamin W. Stevens, M.D.
Springfield Clinic
Springfield, Illinois

Rena L. Stewart, M.D., F.R.C.S.(C)
Associate Professor, Orthopaedic Surgery
Chief, Section of Orthopaedic Trauma
Division of Orthopaedics
Department of Surgery
University of Alabama at Birmingham
Birmingham, Alabama

J. Charles Taylor, M.D.
Orthopaedic Surgeon
Specialty Orthopaedics, P.C.
Memphis, Tennessee

David C. Templeman, M.D.
Associate Professor of Orthopaedic Surgery
University of Minnesota
Department of Orthopaedic Surgery
Hennepin County Medical Center
Minneapolis, Minnesota

Frederick Tonnos, D.O.
Assistant Clinical Professor
Michigan State University
East Lansing, Michigan
Sutter Rosevale Medical Center
Roseville, California
Mercy San Juan Medical Center
Carmichael, California

Paul Tornetta III, M.D.
Professor and Vice Chairman
Department of Orthopaedic Surgery
Director of Orthopaedic Trauma
Boston, Massachusetts

J. Tracy Watson, M.D.
Professor of Orthopaedic Surgery
Chief, Orthopaedic Traumatology
Department of Orthopaedic Surgery
St. Louis University School of Medicine
Saint Louis, Missouri

Neil J. White, M.D., F.R.C.S.(C)
Fellow, Hand and Microvascular Service
New York-Presbyterian Hospital
Columbia University College of Physicians and Surgeons
New York, New York

Patrick J. Wiater, M.D.
Attending Orthopaedic Surgeon
Department of Orthopaedic Surgery
William Beaumont Hospital
Beverly Hills, Michigan

Donald A. Wiss, M.D.
Director of Orthopaedic Trauma
Cedars-Sinai Medical Center
Los Angeles, California

Brad Yoo, M.D.
Assistant Professor
Department of Orthopaedic Surgery
University of California, Davis
Sacramento, California

Bruce H. Ziran, M.D.
Director, Orthopaedic Trauma
Orthopaedic Surgery Residency Program
Atlanta Medical Center
Atlanta, Georgia

Navid M. Ziran, M.D.
Orthopaedic Surgeon
Department of Orthopaedic Surgery
Santa Clara Valley Medical Center
San Jose, California

Series Preface

Since its inception in 1994, the *Master Techniques in Orthopaedic Surgery* series has become the gold standard for both physicians in training and experienced surgeons. Its exceptional success may be traced to the leadership of the original series editor, Roby Thompson, whose clarity of thought and focused vision sought "to provide direct, detailed access to techniques preferred by orthopaedic surgeons who are recognized by their colleagues as 'masters' in their specialty," as he stated in his series preface. It is personally very rewarding to hear testimonials from both residents and practicing orthopaedic surgeons on the value of these volumes to their training and practice.

A key element of the success of the series is its format. The effectiveness of the format is reflected by the fact that it is now being replicated by others. An essential feature is the standardized presentation of information replete with tips and pearls shared by experts with years of experience.

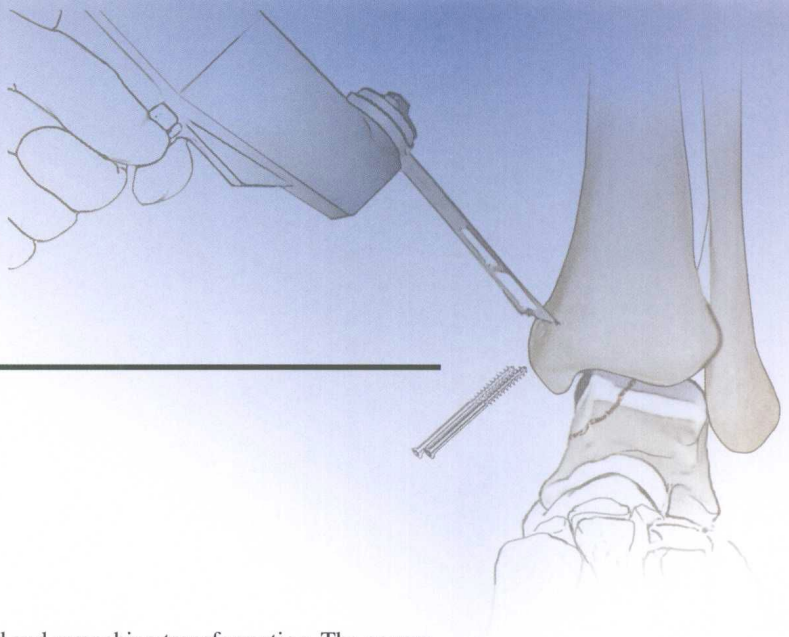
Abundant color photographs and drawings guide the reader through the procedures step-by-step.

The second key to the success of the *Master Techniques* series rests in the reputation and experience of our volume editors. The editors are truly dedicated "masters" with a commitment to share their rich experience through these texts. We feel a great debt of gratitude to them and a real responsibility to maintain and enhance the reputation of the *Master Techniques* series that has developed over the years. We are proud of the progress made in formulating the third edition volumes and are particularly pleased with the expanded content of this series. Six new volumes will soon be available covering topics that are exciting and relevant to a broad cross section of our profession. While we are in the process of carefully expanding *Master Techniques* topics and editors, we are committed to the now-classic format.

The first of the new volumes is *Relevant Surgical Exposures,* which I have had the honor of editing. The second new volume is *Essential Procedures in Pediatrics.* Subsequent new topics to be introduced are *Soft Tissue Reconstruction, Management of Peripheral Nerve Dysfunction, Advanced Reconstructive Techniques in the Joint, Sports Medicine,* and *Orthopaedic Oncology and Complex Reconstruction.* The full library thus will consist of 16 useful and relevant titles.

I am pleased to have accepted the position of series editor, feeling so strongly about the value of this series to educate the orthopaedic surgeon in the full array of expert surgical procedures. The true worth of this endeavor will continue to be measured by the ever-increasing success and critical acceptance of the series. I remain indebted to Dr. Thompson for his inaugural vision and leadership, as well as to the *Master Techniques* volume editors and numerous contributors who have been true to the series style and vision. As I indicated in the preface to the second edition of *The Hip* volume, the words of William Mayo are especially relevant to characterize the ultimate goal of this endeavor: "The best interest of the patient is the only interest to be considered." We are confident that the information in the expanded *Master Techniques* offers the surgeon an opportunity to realize the patient-centric view of our surgical practice.

Bernard F. Morrey, MD



Preface

American medicine remains in the midst of a profound and wrenching transformation. The government, the insurance industry, Wall Street, and patients have demanded improved medical care at lower cost. Better medicine (orthopaedics) occurs when doctors practice medicine consistently on the basis of the best scientific evidence available, set up systems to measure performance, analyze results and outcomes, and make this information widely available to patients and the public. Reduced costs have been achieved partly through a wholesale shift to health maintenance organizations, capitation, and managed care.

Trauma is a complex problem where initial decisions often dramatically determine the ultimate outcome. Death, deformity, and medicolegal entanglements may follow vacillation and error. When treatment is approached with confidence, planning, and technical skill, the associated mortality rate, preventable complications, permanent damage, and economic loss may be significantly reduced. Uncertainty, inactivity, and inappropriate intervention by physicians are all detrimental to patient care. Certain traditional concepts and fixation techniques need to be abandoned and new approaches learned.

This text attempts to address society's mandate to our profession: better orthopaedics at reduced cost. It provides both residents and practitioners with surgical approaches to 46 common but often problematic fractures that, when correctly done, have proven to be safe and effective. It is my hope that the third edition of this textbook remains a valuable fixture in the catalog of literature on fracture management.

Donald A. Wiss, M.D.

Kagan Ozer, M.D.
Clinical Associate Professor of Orthopaedic Surgery
The University of Michigan Medical School
The University of Michigan Health System
Ann Arbor, Michigan

Guy D. Paiement, M.D.
Residency Director for Orthopaedic Surgery
Cedars-Sinai Medical Center
Los Angeles, California

William H. Paterson, M.D.
Orthopaedic Surgeon
Shoulder Service
The Carrell Clinic
Dallas, Texas

Hamid R. Redjal, M.D.
Fellow
Hip and Pelvis Institute
St. John's Medical Center
Santa Monica, California

Mark C. Reilly, M.D.
Assistant Professor of Orthopaedics
Co-Chief, Orthopaedic Trauma Service
University of Medicine & Dentistry of New Jersey
New Jersey Medical School
Newark, New Jersey

David Ring, M.D.
Associate Professor of Orthopaedic Surgery
Harvard Medical School
Director of Research
Hand and Upper Extremity Service
Department of Orthopaedic Surgery
Massachusetts General Hospital
Boston, Massachusetts

Melvin P. Rosenwasser, M.D.
Robert E. Carroll Professor of Orthopaedic Surgery
Columbia University College of Physicians and Surgeons
Director, Orthopaedic Trauma Service
New York Presbyterian Hospital
Director, Hand and Microvascular Service
New York-Presbyterian Hospital
New York, New York

Milton L. Chip Routt Jr., M.D.
Professor of Orthopaedic Surgery
University of Washington
Harborview Medical Center
Seattle, Washington

Adam P. Rumian, M.D., F.R.C.S.(Tr&Orth)
Consultant Orthopaedic Surgeon
Department of Trauma and Orthopaedics
East and North Hertfordshire NHS Trust
Hertfordshire, England

Nicholas Sama, M.D.
Orthopaedic Trauma Surgeon
Center for Bone & Joint Surgery of the Palm Beaches
Royal Palm Beach, Florida
Hospital for Special Surgery
New York, New York

Roy W. Sanders, M.D.
Chief, Department of Orthopaedics
Tampa General Hospital
Director, Orthopaedic Trauma Services
Florida Orthopaedic Institute
Clinical Professor of Orthopaedic Surgery
University of South Florida
Tampa, Florida

Bruce J. Sangeorzan, M.D.
Professor
University of Washington
Harborview Medical Center
Seattle, Washington

Milan K. Sen, M.D., F.R.C.S.C.
Chief
Orthopaedic Trauma Service
Department of Orthopaedic Surgery
The University of Texas Health Science Center
at Houston
Houston, Texas

Benjamin Service, M.D.
Orthopaedic Resident
Orlando Health
Orlando, Florida

Babar Shafiq, M.D.
Director of Orthopaedic Trauma
Howard University Hospital
Washington, District of Columbia

Randy Sherman, M.D.
Vice Chair
Department of Surgery
Cedars Sinai Medical Center
Los Angeles, California

Jodi Siegel, M.D.
Assistant Professor
Department of Orthopaedics
University of Massachusetts Medical School
UMass Memorial Medical Center
Worcester, Massachusetts

James P. Stannard, M.D.
J. Vernon Luck Sr. Distinguished Professor & Chairman
Department of Orthopaedic Surgery
University of Missouri
Columbia, Missouri

Peter A. Cole, M.D.
Chief of Orthopaedic Surgery
Regions Hospital
Professor
University of Minnesota
St. Paul, Minnesota

Cory A. Collinge, M.D.
Director of Orthopaedic Trauma
Harris Methodist Fort Worth Hospital
Clinical Staff
John Peter Smith Hospital
Fort Worth, Texas

Brett D. Crist, M.D., F.A.C.S.
Associate Professor
Co-Director, Orthopaedic Trauma Service
Co-Director, Orthopaedic Trauma Fellowship
Associate Director, Joint Preservation Service
Department of Orthopaedic Surgery
University of Missouri
Columbia, Missouri

Kenneth A. Egol, M.D.
Professor and Vice Chairman
Department of Orthopaedic Surgery
NYU Hospital for Joint Diseases
Langone Medical Center
New York, New York

Christopher G. Finkemeier, M.D., M.B.A.
Co-director
Orthopaedic Trauma Surgeons of Northern California
Granite Bay, California

Thomas Fishler, M.D.
Instructor
Department of Orthopaedics and Rehabilitation
Yale University School of Medicine
New Haven, Connecticut

Paul T. Fortin, M.D.
Associate Professor
Oakland University School of Medicine
William Beaumont Hospital
Royal Oak, Michigan

John T. Gorczyca, M.D.
Professor
Chief, Division of Orthopaedic Trauma
Department of Orthopaedics and Rehabilitation
University of Rochester Medical Center
Rochester, New York

James A. Goulet, M.D.
Professor of Orthopaedic Surgery
The University of Michigan Medical School
The University of Michigan Health System
Ann Arbor, Michigan

George J. Haidukewych, M.D.
Professor of Orthopaedic Surgery
University of Central Florida
Academic Chairman and Chief Orthopaedic Trauma and Adult Reconstruction
Orlando Health
Orlando, Florida

David L. Helfet, M.D.
Professor of Orthopaedic Surgery
Weill Medical College of Cornell University
Director, Orthopaedic Trauma Service
Hospital for Special Surgery/New York-Presbyterian Hospital
New York, New York

Daniel S. Horwitz, M.D.
Chief, Orthopaedic Trauma
Geisinger Health Systems
Danville, Pennsylvania

James J. Hutson Jr., M.D.
Orthopaedic Surgeon
Orthopaedic Trauma
Department of Orthopaedics and Rehabilitation
University of Miami
Miami, Florida

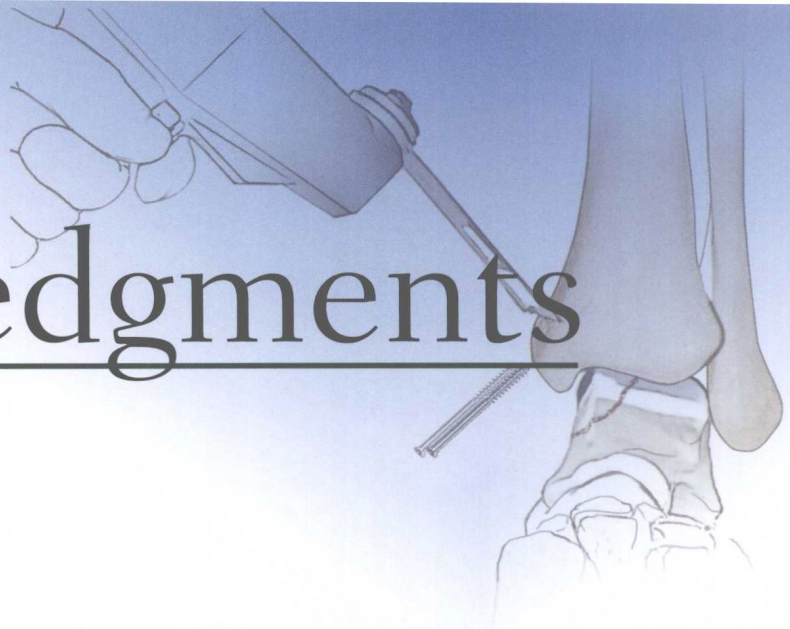
Clifford B. Jones, M.D.
Clinical Professor
Michigan State University
Orthopaedic Associates of Michigan
Grand Rapids, Michigan

Jesse B. Jupiter, M.D.
Hansjorg Wyss/AO Professor
Harvard Medical School
Department of Orthopaedic Surgery
Massachusetts General Hospital
Boston, Massachusetts

Enes M. Kanlic, M.D., F.A.C.S.
Professor
Department of Orthopaedic Surgery and Rehabilitation
Texas Tech University Health Sciences Center in El Paso
El Paso, Texas

Matthew D. Karam, M.D.
Clinical Assistant Professor
Department of Orthopaedics and Rehabilitation
University of Iowa Hospitals and Clinics
Iowa City, Iowa

James C. Krieg, M.D.
Associate Professor
Department of Orthopaedics and Sports Medicine
University of Washington
Harborview Medical Center
Seattle, Washington



Acknowledgments

The modern scientific world is drowning in information. We have more data than we can possibly use or absorb in our professional lifetimes. There is an avalanche of scientific journals, books, videos, and CME courses competing for our attention. The Internet has allowed anyone with a computer to search the World Wide Web for virtually any topic in any field including orthopaedics and fracture care. So why another textbook about fractures? First, the tremendous success of the two previous editions of this text is strong testimony to the fact that students, house-staff, and practicing orthopaedic surgeons still desire a highly organized, informative, and readable textbook to guide treatment of patients with difficult fractures. Second, our specialty continues to relentlessly change in terms of imaging modalities, reduction techniques, and fixation devices. Thus a third edition was undertaken to fill these perceived needs.

My role as Editor is to extract meaning from reams of data, yet remain selectively and self-consciously blind knowing what to ignore, what is extraneous, and what is critical to improve our knowledge base. I could not have devoted 30 years of my life to the study of fractures and nonunions without a passion for this problem and the lessons they offer patient care. I have spent thousands of hours reading, studying, attending courses, reviewing cases, analyzing data, and of course operating, trying to understand fracture management. No sane person would devote such labor, let alone so much of one's life to the pursuit of questions that did not touch one's heart and soul while stimulating the mind.

The third edition of *Master Techniques in Orthopaedic Surgery: Fractures* was 2 years in the making. Anyone undertaking such a work will incur debts of gratitude to a number of people who worked on the project with considerable commitment and little public recognition. I am enormously grateful to my wife Deborah for her unwavering support and love while working on this project often in the evenings and weekends "stealing" our precious family time.

In a textbook on surgical techniques, the illustrations and artwork take on primary significance. I am particularly appreciative of the masterful work of the book's medical illustrator, Bernie Kida. His knowledge of musculoskeletal anatomy, beautiful illustrations, and experience provided a crucial visual correlation with the text, often allowing a near operating room experience.

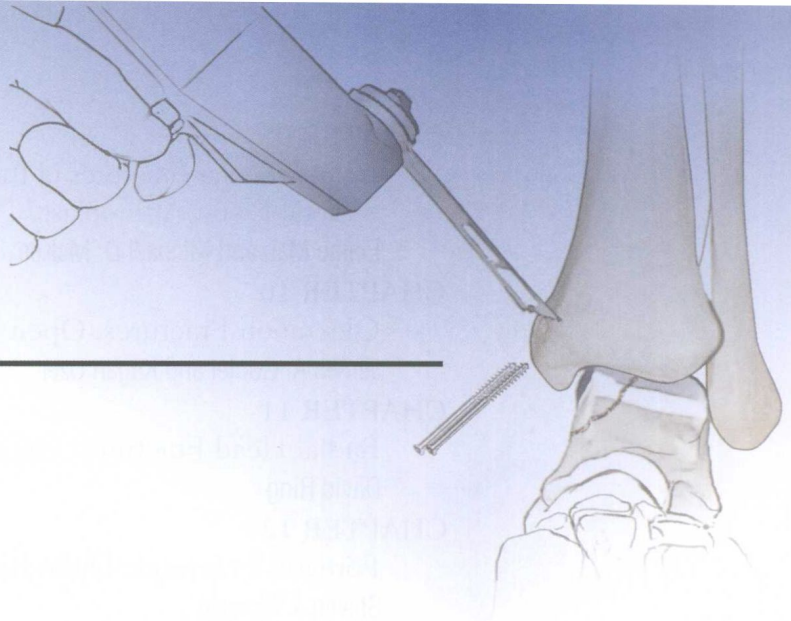
I would like to acknowledge and extend my gratitude to Pamela Swan, my Practice coordinator of 20 plus years. She assisted me with the manuscript preparation for virtually every chapter in the book during the inevitable revision process. This book would have been considerably more difficult without her editorial and organizational talents.

Special thanks are due to Eileen Wolfberg, the contact person between the authors, myself, and publisher. For the record, Eileen has worked with me on all three editions of the *Master Techniques in Orthopaedic Surgery: Fracture* text. Her 30 years of experience in the publishing field and previous professional relationships with many of the contributors to the book made for an unbelievably smooth transition. Eileen, I could not have done this book without you!

The contributions of Elise Paxson, Robert Hurley, Brian Brown, and the entire publishing team at Wolters-Kluwer were crucial to the success of this project. I am particularly indebted to Robert Hurley who "adjusted the budget" to make this such a beautiful book.

Finally, my heartfelt thanks and appreciation to the each of the contributing authors who answered the "bell" once again with yet another academic request for their precious time. Their willingness to share their considerable expertise and to explain the details and nuances of fracture care will unequivocally benefit orthopaedic surgeons everywhere who treat patients with musculoskeletal trauma.

Donald A. Wiss, M.D.
Editor



Contents

PART I
UPPER EXTREMITY

1 Clavicle Fractures: Open Reduction and Internal Fixation

Donald A. Wiss

INTRODUCTION

Clavicle fractures are common injuries and account for approximately 35% to 40% of fractures in the shoulder region. Most occur in the midshaft, and the majority are treated nonoperatively. Nonsurgical management of this injury was based on historic, retrospective, surgeon, or radiographic studies that equated union with success. These early studies concluded that the residual shoulder deformity was primarily cosmetic and that shoulder and upper limb function were satisfactory. In the past 15 years, there has been a paradigm shift in the evaluation and treatment of clavicle fractures because contemporary studies have reported that nonoperative treatment of widely displaced fractures in adults is associated with persistent anatomical deformity, residual shoulder pain and weakness, and subtle neurologic impairment. Furthermore, recent randomized clinical trials comparing nonoperative with surgical treatment of widely displaced clavicle fractures in adults have shown a 15% rate of nonunion and symptomatic malunion, respectively, in nonoperatively treated patients. These newer studies also used patient-oriented limb-specific outcome measures such as the Constant, Dash, or ASES scores and demonstrated statistically significant improvement in validated patient outcome measures following internal fixation. These studies lend support for the use of internal fixation in selected patients with widely displaced clavicle fractures in adults to decrease the incidence of nonunion and malunion. Surgery has proven to be safe and effective with the most common complication being prominent hardware necessitating removal.

Most classification schemes for clavicle fractures divide them into three basic categories. Group I are middle third fractures, Group II are lateral third fractures, and Group III are medial fractures. Neer et al. further subdivided Group II fractures into three distinct subgroups based on associated soft-tissue and ligamentous injuries. In type I injuries, the coracoclavicular ligaments remain intact; in type II injuries, this ligamentous complex is disrupted allowing superior displacement of the lateral fragment; and type III injuries that involve the articular