

Get Full Access and More at

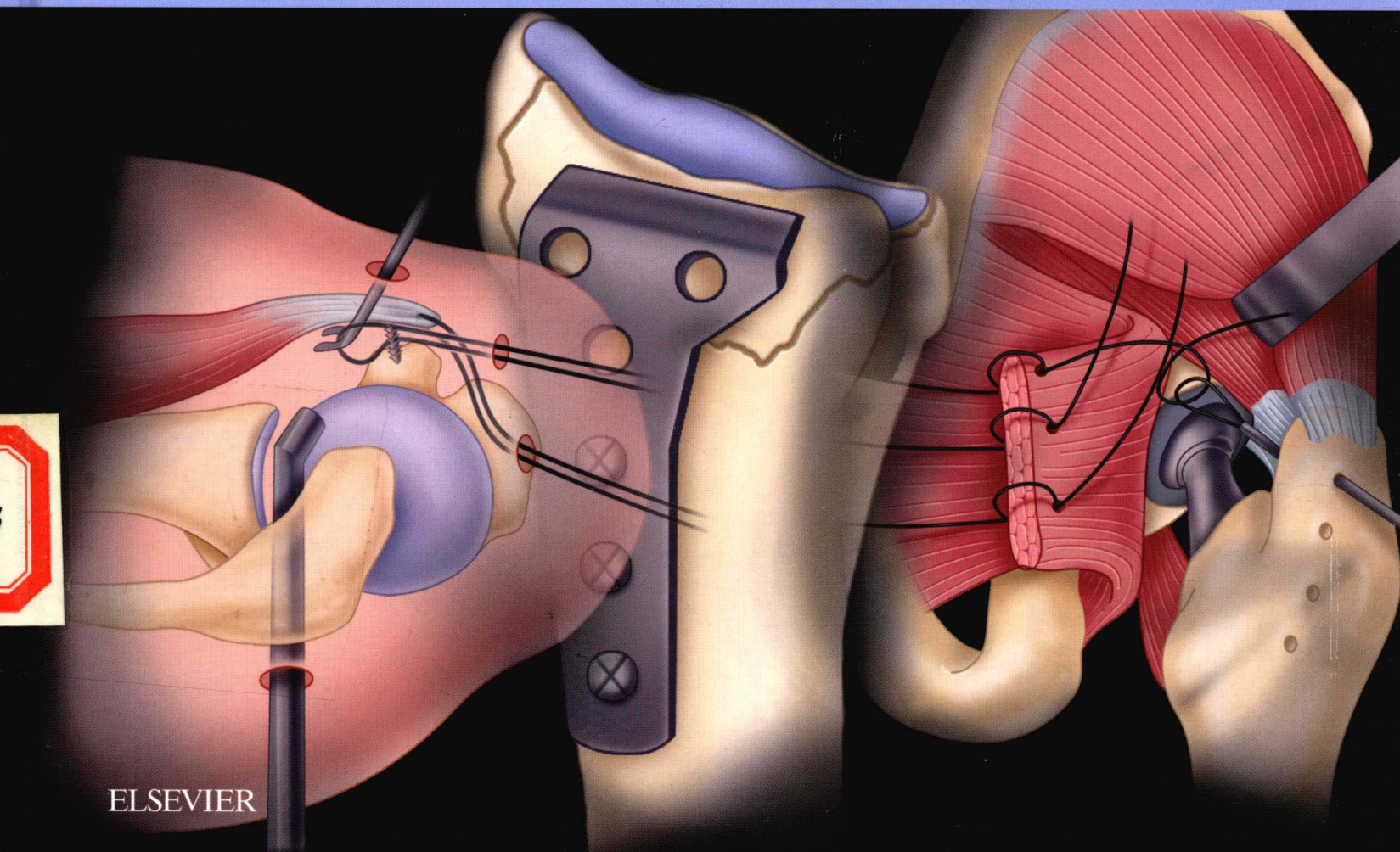
ExpertConsult.com

# CAMPBELL'S

# CORE ORTHOPAEDIC

# PROCEDURES

S. Terry Canale • James H. Beaty • Frederick M. Azar



ELSEVIER



# CAMPBELL'S

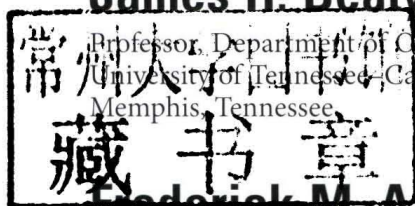
## CORE ORTHOPAEDIC PROCEDURES

**S. Terry Canale, MD**

Harold B. Boyd Professor and Chairman, Department of Orthopaedic Surgery  
University of Tennessee–Campbell Clinic  
Memphis, Tennessee

**James H. Beaty, MD**

Professor, Department of Orthopaedic Surgery  
University of Tennessee–Campbell Clinic  
Memphis, Tennessee



**Frederick M. Azar, MD**

Professor, Department of Orthopaedic Surgery  
University of Tennessee–Campbell Clinic  
Chief of Staff, Campbell Clinic  
Memphis, Tennessee

ELSEVIER

# ELSEVIER

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

CAMPBELL'S CORE ORTHOPAEDIC PROCEDURES

ISBN: 978-0-323-35763-0

Copyright © 2016 by Elsevier, Inc.

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](http://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.

International Standard Book Number: 978-0-323-35763-0

*Executive Content Strategist:* Dolores Meloni  
*Content Development Manager:* Taylor Ball  
*Publishing Services Manager:* Patricia Tannian  
*Senior Project Manager:* John Casey  
*Design Manager:* Renee Duenow  
*Illustrations Manager:* Karen Giacomucci

Printed in China

Last digit is the print number: 9 8 7 6 5 4 3 2 1



Working together  
to grow libraries in  
developing countries

[www.elsevier.com](http://www.elsevier.com) • [www.bookaid.org](http://www.bookaid.org)

# CONTRIBUTORS TO CAMPBELL'S OPERATIVE ORTHOPAEDICS, 12TH EDITION

**WILLIAM E. ALBERS, MD**

Assistant Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**FREDERICK M. AZAR, MD**

Professor  
Director, Sports Medicine Fellowship  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Chief-of-Staff, Campbell Clinic  
Memphis, Tennessee

**JAMES H. BEATY, MD**

Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**JAMES H. CALANDRUCCIO, MD**

Associate Professor  
Director, Hand Fellowship  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**FRANCIS X. CAMILLO, MD**

Associate Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**S. TERRY CANALE, MD**

Harold H. Boyd Professor and Chair  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**DAVID L. CANNON, MD**

Associate Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**KEVIN B. CLEVELAND, MD**

Instructor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**ANDREW H. CRENSHAW, JR., MD**

Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**JOHN R. CROCKARELL, JR., MD**

Associate Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**GREGORY D. DABOV, MD**

Assistant Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**RAYMOND J. GARDOCKI, MD**

Assistant Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**JAMES L. GUYTON, MD**

Associate Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**JAMES W. HARKESS, MD**

Associate Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**ROBERT K. HECK, JR., MD**

Associate Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee



**SUSAN N. ISHIKAWA, MD**

Assistant Professor  
Co-Director, Foot and Ankle Fellowship  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**MARK T. JOBE, MD**

Associate Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**DEREK M. KELLY, MD**

Associate Professor  
Assistant Director, Residency Program  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**DAVID G. LAVELLE, MD**

Associate Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**SANTOS F. MARTINEZ, MD**

Instructor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**ANTHONY A. MASCIOLI, MD**

Assistant Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**MARC J. MIHALKO, MD**

Assistant Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**WILLIAM W. MIHALKO, MD**

Professor, H.R. Hyde Chair of Excellence in Rehabilitation  
Engineering  
Director, Biomedical Engineering  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**ROBERT H. MILLER III, MD**

Associate Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**G. ANDREW MURPHY, MD**

Associate Professor  
Co-Director, Foot and Ankle Fellowship  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**ASHLEY L. PARK, MD**

Clinical Assistant Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**EDWARD A. PEREZ, MD**

Associate Professor  
Director, Trauma Fellowship  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**BARRY B. PHILLIPS, MD**

Associate Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**DAVID R. RICHARDSON, MD**

Assistant Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**E. GREER RICHARDSON, MD**

Professor Emeritus  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**MATTHEW I. RUDLOFF, MD**

Assistant Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**JEFFREY R. SAWYER, MD**

Associate Professor  
Director, Pediatric Orthopaedic Fellowship  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**THOMAS W. THROCKMORTON, MD**

Associate Professor  
Director, Residency Program  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**PATRICK C. TOY, MD**

Assistant Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**WILLIAM C. WARNER, JR., MD**

Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**JOHN C. WEINLEIN, MD**

Assistant Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**A. PAIGE WHITTLE, MD**

Associate Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**KEITH D. WILLIAMS, MD**

Associate Professor  
Director, Spine Fellowship  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**DEXTER H. WITTE, MD**

Clinical Assistant Professor of Radiology  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee

**GEORGE W. WOOD II, MD**

Professor  
University of Tennessee—Campbell Clinic  
Department of Orthopaedic Surgery and Biomedical  
Engineering  
Memphis, Tennessee



# PREFACE

The purpose of this text, as the title suggests, is to describe the “core” procedures from *Campbell’s Operative Orthopaedics*. These include some of the most frequently used procedures at our clinic, as well by orthopaedic surgeons worldwide. We picked what we considered to be the top 100 procedures without regard to specialization or complexity. These procedures are described in no certain order, but generally follow the outline in *Campbell’s Operative Orthopaedics*, edition 12.

The text is intended for orthopaedic residents and fellows and orthopaedic generalists and specialists. It is meant to be a source that is easily accessible in print, online, or via downloadable applications so that the user can find information about a specific procedure at the moment of need. For that reason, only detailed information about the surgical technique itself is included, and indications, contraindications, outcomes, complications, and alternate treatments are not given here.

We have had many requests over the years for a practical, transportable, easily accessible volume of the most popular procedures used at the Campbell Clinic — so, here it is. We hope you like it and find it helpful.

## ACKNOWLEDGMENTS

Our thanks to Kay Daugherty and Linda Jones, medical editors at the Campbell Foundation, and to Taylor Ball, Content Development Manager; John Casey, Senior Project Manager; and Dolores Meloni, Executive Content Strategist at Elsevier.

# CONTENTS

## PART I GENERAL

- TECHNIQUE 1** Bone Graft Harvest: Tibia, Fibula, Iliac Crest, 1  
*Andrew H. Crenshaw, Jr. and G. Andrew Murphy*

## PART II HIP ARTHROPLASTY

- TECHNIQUE 2** Total Hip Arthroplasty: Standard Posterolateral Approach, 7  
*James W. Harkess and John R. Crockarell, Jr.*
- TECHNIQUE 3** Direct Anterior Approach for Total Hip Arthroplasty, 13  
*Patrick Toy*
- TECHNIQUE 4** Trochanteric Osteotomy, 18  
*James W. Harkess and John R. Crockarell, Jr.*
- TECHNIQUE 5** Hip Resurfacing, 23  
*David G. Lavelle*

## PART III TREATMENT OF FEMOROACETABULAR IMPINGEMENT (FAI) AND OSTEONECROSIS

- TECHNIQUE 6** Surgical Dislocation of the Hip, 35  
*James L. Guyton*
- TECHNIQUE 7** Hip Arthroscopy and Limited Open Osteochondroplasty, 40  
*James L. Guyton*
- TECHNIQUE 8** Hip Arthroscopy for Femoroacetabular Impingement, 44  
*Barry B. Phillips and Marc J. Mihalko*
- TECHNIQUE 9** Core Decompression for Osteonecrosis of the Femoral Head — Percutaneous Technique, 48  
*James L. Guyton*

## PART IV KNEE ARTHROPLASTY

- TECHNIQUE 10** Total Knee Arthroplasty — Standard Midline Approach and Bone Preparation, 50  
*William M. Mihalko*
- TECHNIQUE 11** Ligament Balancing: Varus Knee, 56  
*William M. Mihalko*
- TECHNIQUE 12** Ligament Balancing: Valgus Knee, 60  
*William M. Mihalko*
- TECHNIQUE 13** Ligament Balancing: Pie-Crusting, 62  
*William M. Mihalko*
- TECHNIQUE 14** Ligament Balancing: PCL-Balancing, 63  
*William M. Mihalko*
- TECHNIQUE 15** Component Implantation in Total Knee Arthroplasty, 64  
*William M. Mihalko*
- TECHNIQUE 16** Unicondylar Knee Arthroplasty, 65  
*William M. Mihalko*
- TECHNIQUE 17** Lateral Closing Wedge Osteotomy, 68  
*Andrew H. Crenshaw, Jr.*

## PART V ANKLE ARTHROPLASTY/ARTHRODESIS

- TECHNIQUE 18** Total Ankle Arthroplasty, 72  
*G. Andrew Murphy*
- TECHNIQUE 19** Ankle Arthrodesis: Mini-Incision Technique, 75  
*G. Andrew Murphy*



- TECHNIQUE 20** Tibiototalcalcaneal Arthrodesis, 77  
*G. Andrew Murphy*

## PART VI **SHOULDER ARTHROPLASTY**

- TECHNIQUE 21** Total Shoulder Arthroplasty, 82  
*Thomas W. Throckmorton*
- TECHNIQUE 22** Reverse Total Shoulder Arthroplasty, 88  
*Thomas W. Throckmorton*

## PART VII **ELBOW ARTHROPLASTY**

- TECHNIQUE 23** Total Elbow Arthroplasty, 90  
*Thomas W. Throckmorton*

## PART VIII **SPINE**

- TECHNIQUE 24** Posterior C1-2 Fusion, 98  
*Keith D. Williams*
- TECHNIQUE 25** Anterior Cervical Discectomy and Fusion with Locking Plate, 101  
*Keith D. Williams*
- TECHNIQUE 26** Smith-Robinson Anterior Cervical Fusion, 104  
*George W. Wood II*
- TECHNIQUE 27** Anterior Interbody Fusion of the Lumbar Spine, 107  
*George W. Wood II*
- TECHNIQUE 28** Minimally Invasive Transforaminal Lumbar Interbody Fusion (MITLIF), 109  
*Raymond J. Gardocki*
- TECHNIQUE 29** Posterolateral Lumbar Fusion, 114  
*George W. Wood II*
- TECHNIQUE 30** Microscopic Lumbar Discectomy, 116  
*Raymond J. Gardocki*
- TECHNIQUE 31** Interlaminar/Transforaminal Epidural Injections: Cervical, Thoracic, Lumbar, Lumbar/Sacral, Caudal, 120  
*Raymond J. Gardocki and Ashley L. Park*
- TECHNIQUE 32** Facet Block Injections: Cervical, Lumbar, Sacroiliac Joint, 126  
*Raymond J. Gardocki and Ashley L. Park*

## PART IX **SPORTS MEDICINE**

- TECHNIQUE 33** Ankle Arthroscopy, 129  
*Susan N. Ishikawa*
- TECHNIQUE 34** Arthroscopic Treatment of Osteochondral Lesions of the Femoral Condyle, 133  
*Barry B. Phillips and Marc J. Mihalko*

### **A. PATELLOFEMORAL INSTABILITY**

- TECHNIQUE 35** Medial Patellofemoral Ligament Reconstruction for Patellofemoral Instability, 139  
*Barry B. Phillips*
- TECHNIQUE 36** Distal Realignment for Patellofemoral Instability, 143  
*Barry B. Phillips*

### **B. ARTHROSCOPIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION**

- TECHNIQUE 37** Anterior Cruciate Ligament Reconstruction: Anatomical Single-Bundle Endoscopic Reconstruction Using Bone-Patellar Tendon-Bone Graft, 145  
*Barry B. Phillips and Marc J. Mihalko*

**TECHNIQUE 38** Anterior Cruciate Ligament Reconstruction: Endoscopic Quadruple Hamstring Graft, 153  
*Barry B. Phillips and Marc J. Mihalko*

**TECHNIQUE 39** Anterior Cruciate Ligament Reconstruction: Anatomical Double-Bundle, 155  
*Barry B. Phillips and Marc J. Mihalko*

**TECHNIQUE 40** Anterior Cruciate Ligament Reconstruction: Transepiphyseal, Physeal-Sparing, 157  
*Barry B. Phillips and Marc J. Mihalko*

### **C. POSTERIOR CRUCIATE LIGAMENT RECONSTRUCTION**

**TECHNIQUE 41** Open Reconstruction of Posterior Cruciate Ligament with Patellar Tendon Graft, 163  
*Robert H. Miller III and Frederick M. Azar*

**TECHNIQUE 42** Arthroscopic-Assisted Posterior Cruciate Ligament Reconstruction — Single and Double Tunnel, 171  
*Barry B. Phillips and Marc J. Mihalko*

### **D. ACHILLES TENDON RUPTURE**

**TECHNIQUE 43** Open Repair of Achilles Tendon Rupture, 177  
*Frederick M. Azar*

**TECHNIQUE 44** Minimally Invasive Repair of Achilles Tendon Rupture, 182  
*Frederick M. Azar*

### **E. SHOULDER INSTABILITY**

**TECHNIQUE 45** Treatment of Shoulder Instability — Bankart Repair, Open, and Arthroscopic, 185  
*Barry B. Phillips*

**TECHNIQUE 46** Treatment of Shoulder Instability — Capsular Shift, Posterior Capsular Shift, Arthroscopic Capsular Shift, 195  
*Barry B. Phillips*

**TECHNIQUE 47** Open Repair of Rotator Cuff Tears, 202  
*Robert H. Miller III, Frederick M. Azar, and Thomas W. Throckmorton*

**TECHNIQUE 48** Arthroscopic Repair of Rotator Cuff Tears, 208  
*Barry B. Phillips*

**TECHNIQUE 49** Arthroscopic Fixation of Type II SLAP Lesions, 213  
*Barry B. Phillips*

### **F. BICEPS TENDON RUPTURE**

**TECHNIQUE 50** Biceps Repair — Open Approaches, 220  
*Frederick M. Azar*

**TECHNIQUE 51** Biceps Repair — Arthroscopic Approaches, 225  
*Barry B. Phillips*

### **G. ELBOW**

**TECHNIQUE 52** Arthroscopic Elbow Examination, 229  
*Barry B. Phillips*

**TECHNIQUE 53** Release for Lateral and Medial Epicondylitis — Open and Arthroscopic Techniques, 234  
*Robert H. Miller III, Frederick M. Azar, Thomas W. Throckmorton, and Barry B. Phillips*

**TECHNIQUE 54** Ulnar Collateral Ligament Reconstruction, 239  
*Barry B. Phillips*



## PART X TRAUMA

### A. FRACTURES

- TECHNIQUE 55** Fixation of the Lateral and Medial Malleoli, 247  
*Matthew I. Rudloff*
- TECHNIQUE 56** Intramedullary Nailing of Tibial Shaft Fractures, 250  
*Matthew I. Rudloff*
- TECHNIQUE 57** Open Reduction and Fixation of Tibial Plateau Fractures, 256  
*Matthew I. Rudloff*
- TECHNIQUE 58** Tension Band Wiring Fixation of Patellar Fractures, 260  
*Matthew I. Rudloff*
- TECHNIQUE 59** Intramedullary Nailing of Femoral Shaft Fractures — Antegrade and Retrograde, 263  
*Matthew I. Rudloff*
- TECHNIQUE 60** Compression Hip Screw Fixation of Intertrochanteric Femoral Fractures, 272  
*John C. Weinlein*
- TECHNIQUE 61** Intramedullary Nailing of Subtrochanteric Fractures, 277  
*John C. Weinlein*
- TECHNIQUE 62** Intramedullary Fixation of Clavicular Fractures, 281  
*Edward A. Perez*
- TECHNIQUE 63** Intramedullary Nailing of Proximal Humeral Fractures, 286  
*Edward A. Perez*
- TECHNIQUE 64** Antegrade Intramedullary Nailing of Humeral Shaft Fractures, 290  
*Edward A. Perez*
- TECHNIQUE 65** Open Reduction and Internal Fixation of the Distal Humerus with Olecranon Osteotomy, 293  
*Edward A. Perez*
- TECHNIQUE 66** Open Reduction and Internal Fixation of Both-Bone Forearm Fractures, 297  
*Edward A. Perez*

### B. COMPARTMENT SYNDROME

- TECHNIQUE 67** Fasciotomy for Acute Compartment Syndrome in the Leg — Single and Double Incisions, 300  
*Frederick M. Azar*
- TECHNIQUE 68** Forearm Fasciotomy and Arterial Exploration, 304  
*Mark T. Jobe*

### C. FRACTURES IN CHILDREN

- TECHNIQUE 69** Intramedullary Nailing of Both-Bone Forearm Fractures, 306  
*S. Terry Canale and James H. Beaty*
- TECHNIQUE 70** Closed Reduction and Percutaneous Pinning of Supracondylar Fractures, 307  
*S. Terry Canale and James H. Beaty*
- TECHNIQUE 71** Flexible Intramedullary Nailing of Femoral Fractures, 309  
*S. Terry Canale and James H. Beaty*
- TECHNIQUE 72** Open Reduction and Internal Fixation of Tibial Eminence Fractures, 312  
*S. Terry Canale and James H. Beaty*
- TECHNIQUE 73** Arthroscopic Reduction of Tibial Eminence Fractures and Internal Fixation with Bioabsorbable Nails, 313  
*S. Terry Canale and James H. Beaty*
- TECHNIQUE 74** Open Reduction and Internal Fixation of Proximal Tibial Physeal Fractures, 314  
*S. Terry Canale and James H. Beaty*
- TECHNIQUE 75** Percutaneous In Situ Pinning for Slipped Capital Femoral Epiphysis, 316  
*S. Terry Canale and James H. Beaty*

**PART XI HAND AND WRIST**

- TECHNIQUE 76** Flexor Tendon Repair, 320  
*David L. Cannon*
- TECHNIQUE 77** Subcutaneous Fasciotomy, Partial Fasciectomy for Dupuytren Contracture, 328  
*James H. Calandruccio*
- TECHNIQUE 78** Closed Reduction and Percutaneous Pinning of Distal Radial Fractures, 333  
*Edward A. Perez*
- TECHNIQUE 79** Volar Plate Fixation of Fractures of the Distal Radius, 336  
*Edward A. Perez*
- TECHNIQUE 80** Scaphoid Fractures — Open Reduction and Internal Fixation and Percutaneous Fixation, 340  
*David L. Cannon*
- TECHNIQUE 81** Dynamic External Splint Reduction of Proximal Interphalangeal Joint Fracture-Dislocations, 349  
*James H. Calandruccio*
- TECHNIQUE 82** Mini-Palm Open and Open Carpal Tunnel Release, 352  
*James H. Calandruccio*
- TECHNIQUE 83** Endoscopic Carpal Tunnel Release Through One or Two Incisions, 356  
*James H. Calandruccio*
- TECHNIQUE 84** Trigger Finger Release — Open and Percutaneous, 363  
*James H. Calandruccio*
- TECHNIQUE 85** Metacarpophalangeal Arthrodesis of the Thumb, 366  
*James H. Calandruccio*
- TECHNIQUE 86** Fingertip Amputations: Thenar Flap, Local Neurovascular Island Flap, and Island Pedicle Flap, 371  
*James H. Calandruccio*

**PART XII FOOT AND ANKLE****A. LOCAL ANESTHESIA**

- TECHNIQUE 87** Forefoot Block, 375  
*E. Greer Richardson*
- TECHNIQUE 88** Ankle Block, 379  
*E. Greer Richardson*

**B. HALLUX VALGUS**

- TECHNIQUE 89** Modified McBride Bunionectomy, 382  
*E. Greer Richardson*
- TECHNIQUE 90** Keller Arthroplasty for Hallux Valgus, 394  
*E. Greer Richardson*
- TECHNIQUE 91** Distal Chevron Metatarsal Osteotomy for Hallux Valgus, 401  
*E. Greer Richardson*
- TECHNIQUE 92** Proximal First Metatarsal Osteotomies — Crescentic and Chevron, 408  
*E. Greer Richardson*
- TECHNIQUE 93** Endoscopic Plantar Fascia Release — Two-Portal and Single-Portal, 417  
*G. Andrew Murphy*
- TECHNIQUE 94** Flexor Hallucis Longus Transfer for Chronic Noninsertional Achilles Tendinosis, 421  
*G. Andrew Murphy*
- TECHNIQUE 95** Calcaneal Fracture — Open Reduction and Internal Fixation, Percutaneous Fixation, 424  
*Susan N. Ishikawa*



- TECHNIQUE 96** Screw Fixation of Fifth Metatarsal Fractures, 431  
*Susan N. Ishikawa*
- TECHNIQUE 97** Lateral Repair of Chronic Instability: Modified Broström, 433  
*David R. Richardson*
- TECHNIQUE 98** Osteochondral Autograft/Allograft Transplantation for Osteochondral Lesions of the Talus, 436  
*David R. Richardson*
- TECHNIQUE 99** Anterior and Posterior Débridement for Impingement Syndromes, 439  
*David R. Richardson and Susan Ishikawa*
- TECHNIQUE 100** Achilles Tendon Lengthening: Z-Plasty and Percutaneous Techniques, 444  
*Jeffrey R. Sawyer*

# VIDEO CONTENTS

- 10-1** Minimally Invasive Total Knee Arthroplasty  
*James W. Harkess*
- 17-1** Supracondylar Osteotomy for the Arthritic Valgus Knee  
*Andrew H. Crenshaw, Jr.*
- 21-1** Total Shoulder Arthroplasty  
*Thomas W. Throckmorton*
- 22-1** Reverse Total Shoulder Arthroplasty  
*Thomas W. Throckmorton*
- 23-1** Total Elbow Arthroplasty #1  
*Andrew H. Crenshaw, Jr.*
- 23-2** Total Elbow Arthroplasty #2  
*Thomas W. Throckmorton*
- 25-1** Anterior Cervical Discectomy and Fusion  
*Keith D. Williams*
- 30-1** Microscopic Lumbar Discectomy  
*Keith D. Williams*
- 48-1** Rotator Cuff Repair  
*Barry B. Phillips*
- 61-1** Reconstruction Nailing of Femoral Fractures  
*Andrew H. Crenshaw, Jr.*
- 66-1** Intramedullary Nailing of Forearm Fractures  
*Andrew H. Crenshaw, Jr.*
- 70-1** Supracondylar Fractures of the Humerus Pinning Technique  
*James H. Beaty*
- 75-1** Screw Fixation of Slipped Capital Femoral Epiphysis  
*William C. Warner, Jr.*
- 80-1** Scaphoid Repair: Dorsal Approach  
*George W. Wood II*
- 90-1** Modified Keller Bunionectomy  
*E. Greer Richardson, G. Andrew Murphy*
- 91-1** Chevron Osteotomy for Hallux Valgus  
*E. Greer Richardson*
- 95-1** Open Reduction and Internal Fixation of Calcaneal Fractures  
*G. Andrew Murphy*



# BONE GRAFT HARVEST: TIBIA, FIBULA, ILIAC CREST

Andrew H. Crenshaw, Jr. • G. Andrew Murphy

## TECHNIQUE 1

### REMOVAL OF A TIBIAL GRAFT

- To avoid excessive loss of blood, use a tourniquet (preferably pneumatic) when the tibial graft is removed. After removal of the graft, the tourniquet can be released without disturbing the sterile drapes.
- Make a slightly curved longitudinal incision over the anteromedial surface of the tibia, placing it so as to prevent a painful scar over the crest.
- Without reflecting the skin, incise the periosteum to the bone.
- With a periosteal elevator, reflect the periosteum medially and laterally exposing the entire surface of the tibia between the crest and the medial border. For better exposure at each end of the longitudinal incision, incise the periosteum transversely. The incision through the periosteum is I shaped.

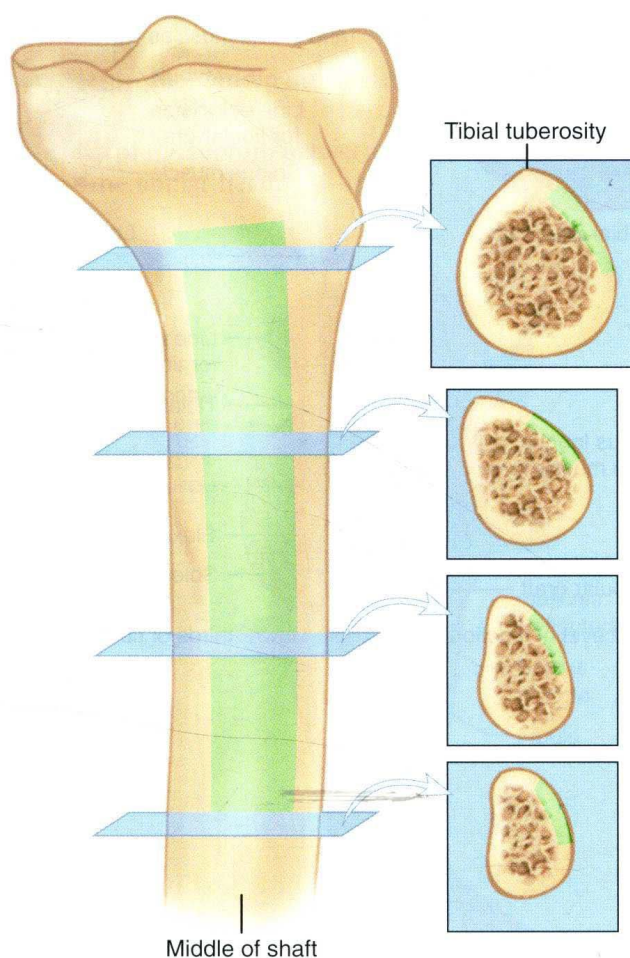


Figure 1-1

- Because of the shape of the tibia, the graft is usually wider at the proximal end than at the distal end. This equalizes the strength of the graft because the cortex is thinner proximally than distally. Before cutting the graft, drill a hole at each corner of the anticipated area (Figure 1-1).
- With a single-blade saw, remove the graft by cutting through the cortex at an oblique angle, preserving the anterior and medial borders of the tibia. Do not cut beyond the holes, especially when cutting across at

the ends because overcutting here weakens the donor bone and may serve as the initiation point of a future fracture. This is particularly true at the distal end of the graft.

- As the graft is pried from its bed have an assistant grasp it firmly to prevent it from dropping to the floor.
- Before closing the wound, remove additional cancellous bone from the proximal end of the tibia with a curet. Take care to avoid the articular surface of the tibia or in the case of a child, the physis.
- The periosteum over the tibia is relatively thick in children and can usually be sutured as a separate layer. In adults it is often thin, and closure may be unsatisfactory. Suturing the periosteum and the deep portion of the subcutaneous tissues as a single layer is recommended.
- If the graft has been properly cut, little shaping is necessary. Our practice is to remove the endosteal side of the graft because (1) the thin endosteal portion provides a graft to be placed across from the cortical graft; and (2) the endosteal surface, being rough and irregular, should be removed to ensure good contact of the graft with the host bone.

## REMOVAL OF FIBULAR GRAFTS

Three points should be considered during the removal of a fibular graft: (1) the peroneal nerve must not be damaged; (2) the distal fourth of the bone must be left to maintain a stable ankle; and (3) the peroneal muscles should not be cut (Figure 1-2).

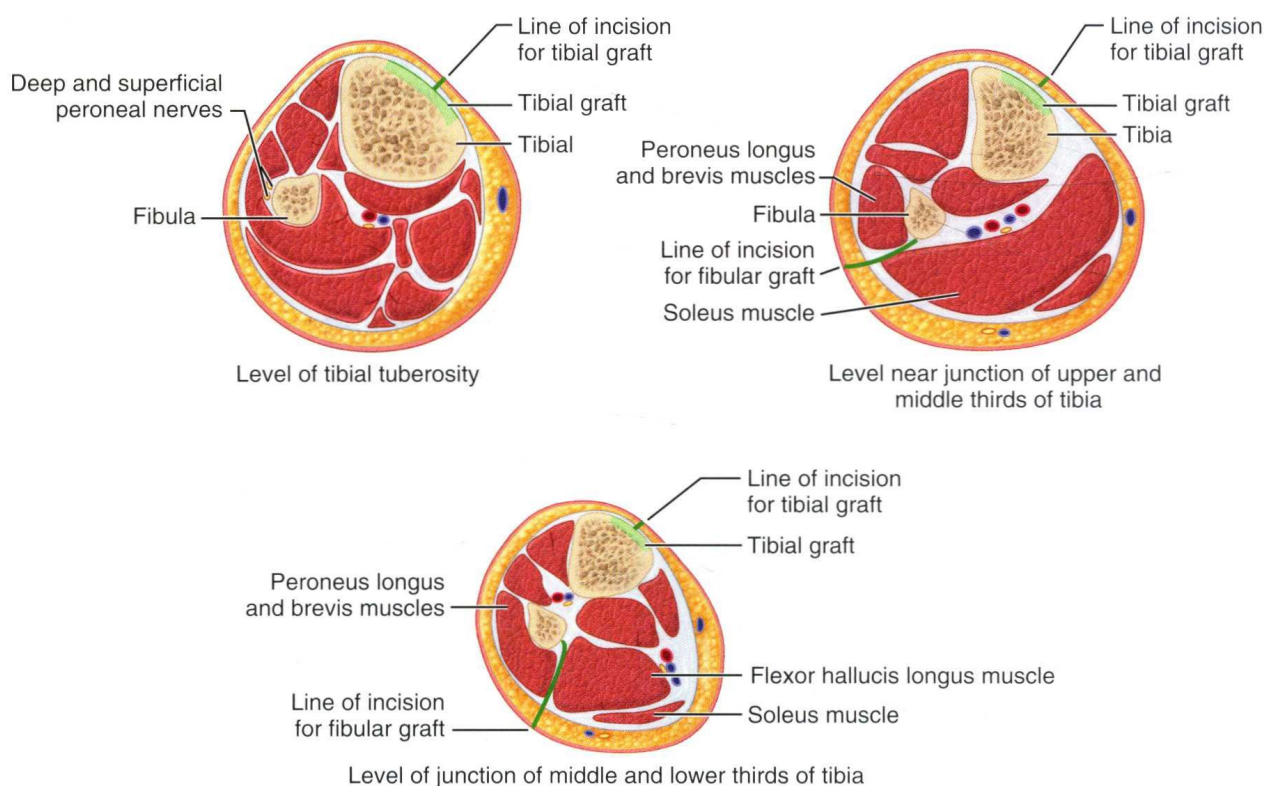


Figure 1-2



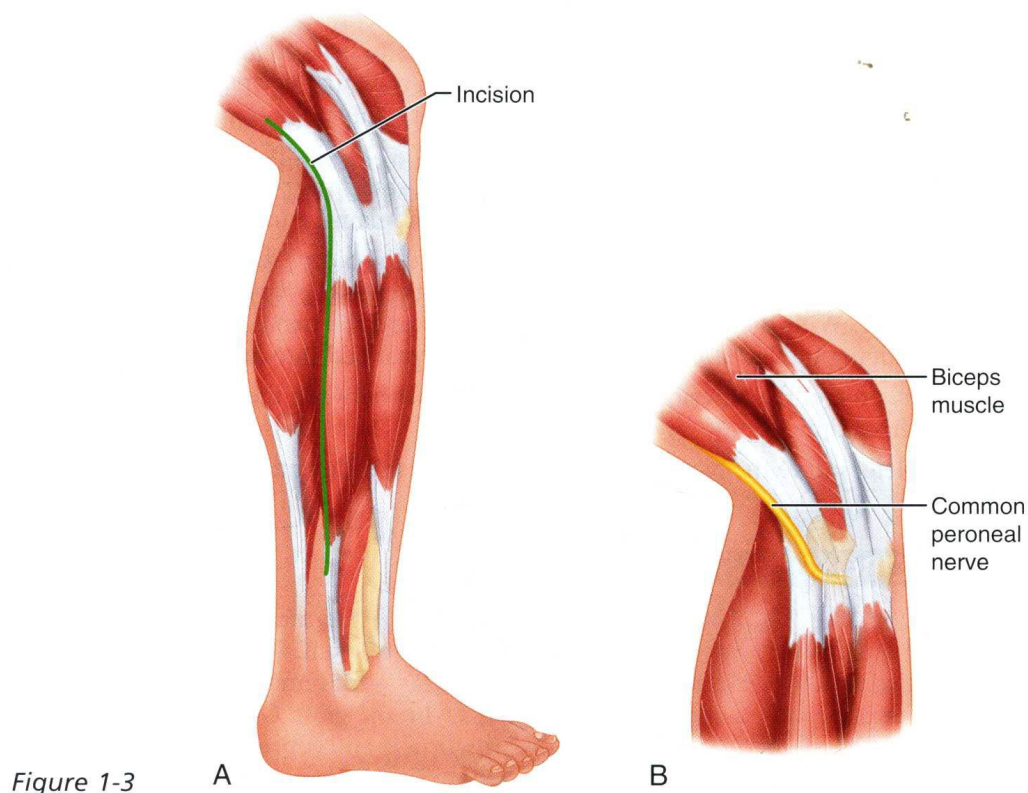


Figure 1-3

- For most grafting procedures, resect the middle third or middle half of the fibula using a Henry approach (Figure 1-3).
- Dissect along the anterior surface of the septum between the peroneus longus and soleus muscles. Identify the common peroneal nerve at the fibular head.

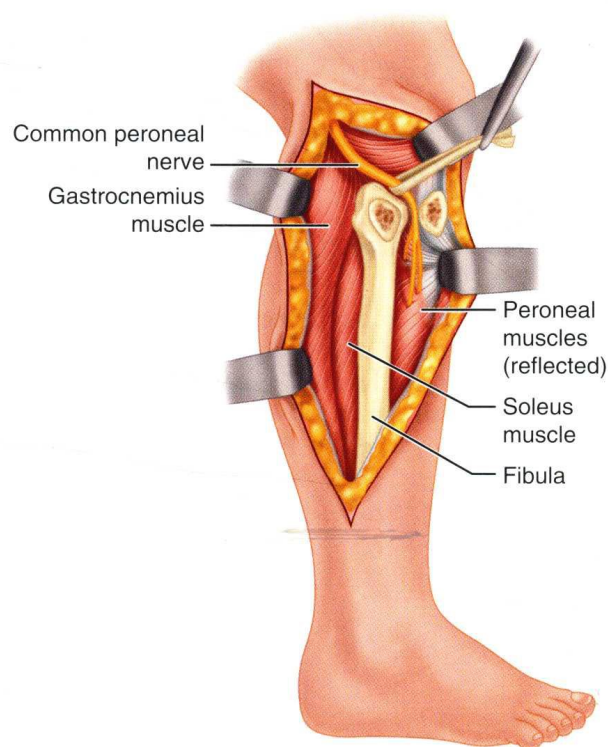


Figure 1-4

- Reflect the peroneal muscles anteriorly after subperiosteal dissection (Figure 1-4).
- Begin the stripping distally and progress proximally so that the oblique origin of the muscle fibers from the bone tends to press the periosteal elevator toward the fibula.