

*Eighth Edition*

**CAMPBELL'S  
OPERATIVE  
ORTHOPAEDICS**

*Edited by*

**A.H. CRENSHAW, M.D.**

**VOLUME THREE**

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*Eighth Edition*

# **CAMPBELL'S OPERATIVE ORTHOPAEDICS**

*Edited by*

**A.H. CRENSHAW, M.D.**

*Editorial assistance by*

**KAY DAUGHERTY**

*Art coordination by*

**CHARLES CURRO**



*with over 7900 illustrations*

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## EIGHTH EDITION

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**VOLUME THREE**

**CAMPBELL'S  
OPERATIVE ORTHOPAEDICS**

# Contributors

## **JAMES H. BEATY, M.D.**

*Chapters 42, 43, 44, and 47*

Associate Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Chief, Tennessee Crippled Children's Service; Associate Chief of Pediatric Orthopaedics, LeBonheur Children's Medical Center; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, Regional Medical Center at Memphis, Veterans' Administration Medical Center

## **JAMES H. CALANDRUCCIO, M.D.**

*Chapter 70*

Instructor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinics, Inc., Baptist Memorial Hospitals, Administration Hospital, LeBonheur Children's Medical Center

## **S. TERRY CANALE, M.D.**

*Chapters 26, 32, and 40*

Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Chief of Pediatric Orthopaedics, LeBonheur Children's Medical Center; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospital; Consultant Staff, Regional Medical Center at Memphis, Veterans' Administration Medical Center

## **PETER G. CARNESALE, M.D.**

*Chapters 7 through 12*

Clinical Associate Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Chief of Orthopaedics, Veterans' Administration Medical Center; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospital, Regional Medical Center at Memphis; Consultant Staff, LeBonheur Children's Medical Center, St. Joseph Hospital, St. Jude Children's Research Hospital, Methodist Hospitals

## **A.H. CRENSHAW, M.D.**

*Chapter 1*

Clinical Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Emeritus Staff, Campbell Clinic, Inc.

## **ANDREW H. CRENSHAW, JR., M.D.**

*Chapters 2, 25, and 34*

Assistant Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, Regional Medical Center at Memphis, Veterans' Administration Medical Center; Associate Staff, LeBonheur Children's Medical Center; Consultant Staff, University of Tennessee—William F. Bowld Hospital; Courtesy Staff, Baptist Memorial Hospital—Germantown

## **JOSEPH P. DUTKOWSKY, M.D.**

*Chapter 41*

Assistant Professor and Director of Laboratory Research, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, University of Tennessee—William F. Bowld Hospital, LeBonheur Children's Medical Center, Regional Medical Center at Memphis, Veterans' Administration Hospital, Baptist Memorial Hospitals; Consultant Staff, St. Jude Children's Research Hospital, St. Joseph Hospital

## **ALLEN S. EDMONSON, M.D.**

*Chapters 81 and 82*

Clinical Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery; Assistant Dean, University of Tennessee, Memphis; Director of Graduate Medical Education, Baptist Memorial Hospital; Active Staff, Campbell Clinic, Inc., Regional Medical Center at Memphis; Consultant Staff, Methodist Hospital, St. Francis Hospital, St. Joseph Hospital, Veterans' Administration Medical Center; LeBonheur Children's Medical Center

## **BARNEY L. FREEMAN III, M.D.**

*Chapters 30, 31, and 83*

Clinical Associate Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, Regional Medical Center at Memphis; Consultant Staff, LeBonheur Children's Medical Center, Methodist Hospital, Germantown Community Hospital—Methodist Hospital East, St. Francis Hospital, Veterans' Administration Medical Center

## **STANLEY C. GRAVES, M.D.**

*Chapter 58*

Instructor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, University of Tennessee—William F. Bowld Hospital, Regional Medical Center at Memphis

## **JAMES W. HARKESS, M.D.**

*Chapters 14 and 16*

Assistant Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Regional Medical Center at Memphis, University of Tennessee—William F. Bowld Hospital, LeBonheur Children's Medical Center, Veterans' Administration Medical Center, Baptist Memorial Hospitals

## **MARK T. JOBE, M.D.**

*Chapters 45, 49, 69, 70, 71, 73, 74, 75, and 77*

Instructor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, University of Tennessee—William F. Bowld Hospital, Regional Medical Center at Memphis, LeBonheur Children's Medical Center, Veterans' Administration Medical Center

**E. JEFF JUSTIS, JR., M.D.***Chapters 13 and 64*

Clinical Associate Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospital, Regional Medical Center at Memphis; Consultant Staff, Arlington Developmental Center, LeBonheur Children's Medical Center, Veterans' Administration Medical Center; Courtesy Staff, Methodist Hospital; Consultant to the Surgeon General, United States Air Force; Consultant Staff in Hand Surgery, Mississippi and Tennessee Crippled Children's Services

**DAVID G. LAVELLE, M.D.***Chapter 29*

Assistant Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, Regional Medical Center at Memphis, University of Tennessee—William F. Bowld Hospital; Consultant Staff, LeBonheur Children's Medical Center, Veterans' Administration Medical Center

**MARVIN R. LEVENTHAL, M.D.***Chapters 79 and 80*

Assistant Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, Regional Medical Center at Memphis, LeBonheur Children's Medical Center, University of Tennessee—William F. Bowld Hospital; Consultant Staff, Veterans' Administration Medical Center

**LEE W. MILFORD, M.D.***Chapter 69*

Clinical Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Emeritus Staff, Campbell Clinic, Inc.

**ROBERT H. MILLER III, M.D.***Chapters 35, 36, and 37*

Assistant Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, Regional Medical Center at Memphis, University of Tennessee—William F. Bowld Hospital, Veterans' Administration Medical Center

**BARRY B. PHILLIPS, M.D.***Chapters 38 and 39*

Instructor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, Regional Medical Center at Memphis; Courtesy Staff, LeBonheur Children's Medical Center

**E. GREER RICHARDSON, M.D.***Chapters 50 through 60*

Associate Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, Regional Medical Center at Memphis; Consultant Staff, University of Tennessee—William F. Bowld Hospital, Veterans' Administration Medical Center; Courtesy Staff, LeBonheur Children's Medical Center

**THOMAS A. RUSSELL, M.D.***Chapters 22, 24, and 27*

Associate Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee,

Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, Regional Medical Center at Memphis, University of Tennessee—William F. Bowld Hospital; Consultant Staff, Veterans' Administration Medical Center, LeBonheur Children's Medical Center

**FRED P. SAGE, M.D.***Chapters 46 and 48*

Clinical Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, Regional Medical Center at Memphis, LeBonheur Children's Medical Center, Methodist Hospitals

**T. DAVID SISK, M.D.***Chapters 17 and 33*

Professor and Acting Chairman, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, LeBonheur Children's Medical Center, Methodist Hospitals, Regional Medical Center at Memphis, University of Tennessee—William F. Bowld Hospital

**J. CHARLES TAYLOR, M.D.***Chapters 23 and 28*

Assistant Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, Regional Medical Center at Memphis, University of Tennessee—William F. Bowld Hospital, LeBonheur Children's Medical Center, Veterans' Administration Medical Center

**ROBERT E. TOOMS, M.D.***Chapters 14, 15, 18, 19, 20, and 21*

Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Chief of Staff, Campbell Clinic, Inc.; Active Staff, Baptist Memorial Hospitals, LeBonheur Children's Medical Center, Regional Medical Center at Memphis; Medical Director, University of Tennessee Rehabilitation Engineering Center; Medical Director, Regional Spinal Cord Center; Chief, Memphis Child Amputee Clinic and St. Jude Children's Research Hospital Amputee Clinic

**WILLIAM C. WARNER, JR., M.D.***Chapters 3 through 6*

Instructor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Chief, Mississippi Crippled Children's Service; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, LeBonheur Children's Medical Center, Veterans' Administration Medical Center, University of Tennessee—William F. Bowld Hospital

**GEORGE W. WOOD II, M.D.***Chapters 84, 85, and 86*

Clinical Associate Professor, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, Regional Medical Center at Memphis; Consultant Staff, LeBonheur Children's Medical Center, Veterans' Administration Medical Center, University of Tennessee—William F. Bowld Hospital

**PHILLIP E. WRIGHT II, M.D.***Chapters 17, 45, 49, 61, 62, 63, 65, 66, 67, 68, 72, 74, 76, and 78*

Associate Professor, Director of Hand Fellowship, and Director of Orthopaedic Microsurgery, University of Tennessee—Campbell Clinic Department of Orthopaedic Surgery, University of Tennessee, Memphis; Chief of Hand Surgery Service, Regional Medical Center at Memphis; Active Staff, Campbell Clinic, Inc., Baptist Memorial Hospitals, University of Tennessee—William F. Bowld Hospital, Veterans' Administration Medical Center



**WILLIS C. CAMPBELL, M.D.**

1880-1941

## Preface to Eighth Edition

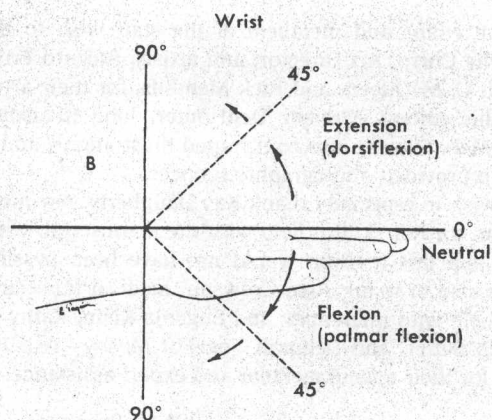
Many new methods and techniques in orthopaedic surgery have been developed or refined during the last 5 to 6 years; those of importance to practicing orthopaedic surgeons are included in this eighth edition.

All chapters have been revised and brought up-to-date. All are written by members of the staff of the Campbell Clinic. Several authors, some new to this edition, have had much experience in a busy, Level 1 trauma center, and this experience is reflected in the discussions on

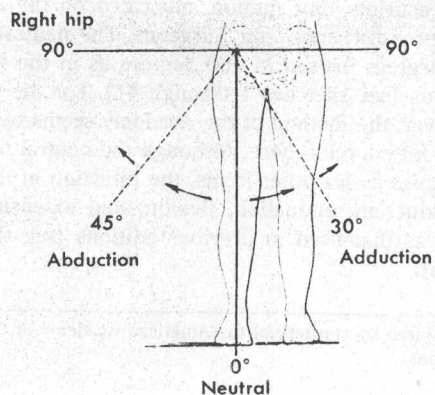
fresh fractures, delayed unions, nonunions, microsurgery, and other subjects.

The format of this edition is essentially the same as for the last edition. The discussions on the foot have been expanded into 11 chapters and on the hand into 18. A total of 86 chapters have been grouped into 18 parts for better presentation. Over 2300 illustrations are new or totally redrawn.

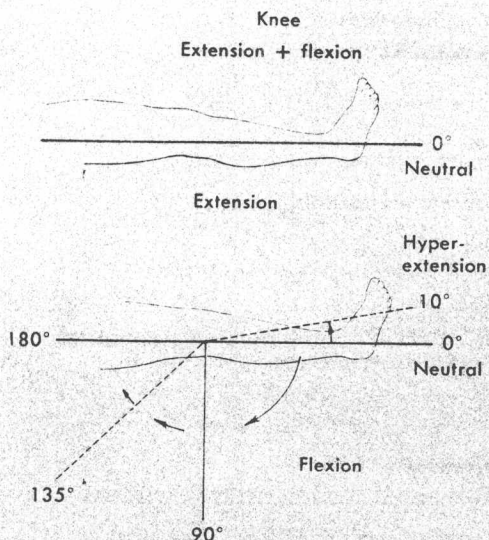
We have continued to use almost entirely the method



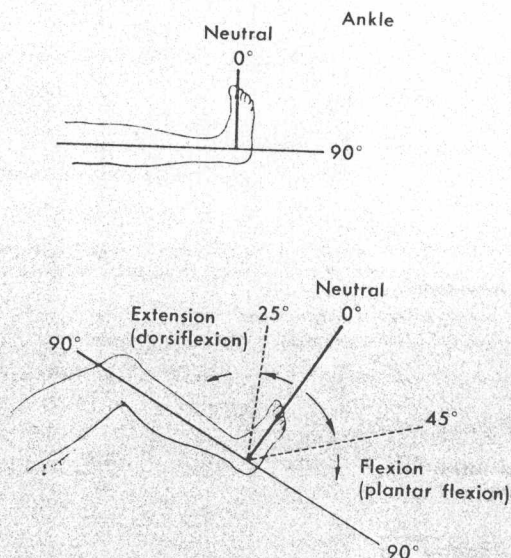
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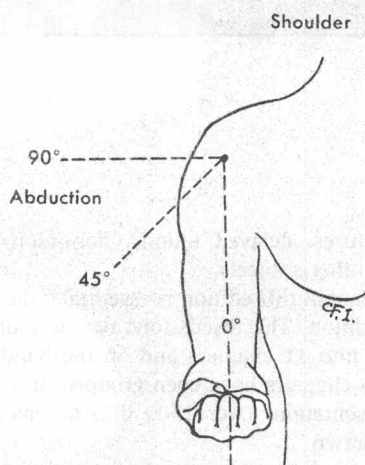
Sketch 2



Sketch 3



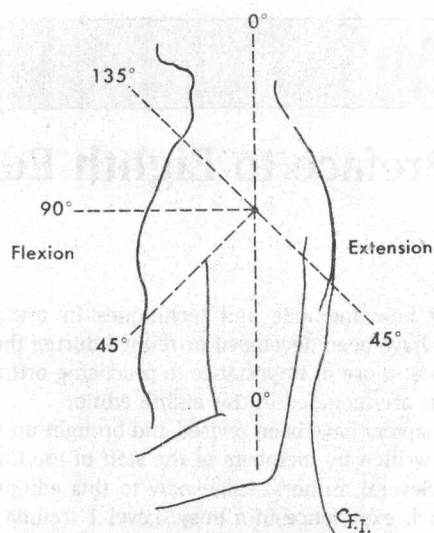
Sketch 4



Sketch 5

of measuring joint motion advocated by the American Academy of Orthopaedic Surgeons. The neutral position is 0 degrees instead of 180 degrees as in the first three editions (see sketches 1 through 4\*). For the shoulder, however, the method of the Academy seems too complicated for adoption here. Although the neutral position is 0 degrees as for other joints, the direction of movement in adduction, abduction, flexion, and extension is the same as that used in previous editions (see sketches 5 and 6).

Reproduced by courtesy of the American Academy of Orthopaedic Surgeons.



Sketch 6

The editor and members of the staff wish to thank Charlie Curro, Art Director, and artists, Richard Fritzler, Sarah C. McQueen, and Rick Mendijs, for their artwork for this edition. Marlene DenHouter, John Klausmeyer, and Mary Stewart also contributed illustrations, and Dan Ralph provided photographic services.

I wish to especially thank Kay Daugherty, our medical editor, for her skillful help with the manuscript; without her help this revision would not have been possible. I wish also to thank Joan Crowson, medical librarian, for her help with references, and Eugenia Klein, Kathy Falk, Robin Sutter, and Deborah Vogel at Mosby-Year Book, Inc. for their encouragement and expert assistance.

A.H. Crenshaw, M.D.

## Preface to First Edition

The title of this book, *Operative Orthopedics*, is not intended to convey the impression that the chief or most important method of treatment of orthopaedic affections is open surgery. Although many orthopaedic affections are best treated by operative measures alone, the majority are successfully treated by more conservative means. Further, such measures are often essential adjuncts either before or after operation.

This volume has been written to meet the current need for a comprehensive work on operative orthopedics, not only for the specialist, but also for many industrial and general surgeons who are doing excellent work in some branches of orthopedic surgery, and are making valuable contributions to this field.

The evolution of orthopedic surgery has been exceedingly slow as compared to that of surgery in general. Not until aseptic technic had been materially refined was surgery of the bones and joints feasible. The statement is often made that the World War afforded the experience which made possible the rapid development of orthopedic surgery during the past two decades. The surgery of the war, however, was chiefly the surgery of sepsis; there was little of the refined asepsis which is required in reconstruction surgery. Undoubtedly, the demonstration during the war of the necessity and importance of this field led many able men to specialize in orthopedics, and to them considerable credit is due for its subsequent progress.

No classification of orthopedic affections is entirely satisfactory; consequently, any arrangement of operative procedures is subject to similar criticism. With the exception of the chapters on Arthroplasty and Arthrodesis, operations described in this text are grouped together according to their applicability to a given affection. This involves less repetition as to generalities of etiology, pathology, and treatment than would be necessary in a classification according to anatomic location. Operative procedures appropriate to two or more affections are described in the discussion of the one wherein they are most commonly employed.

To overcome the too widespread conception of orthopedic surgery as a purely mechanical equation, an effort is made in the first chapter of this book to correlate the mechanical, surgical, and physiologic principles of orthopedic practice, and throughout the book to emphasize the practical application of these physiologic principles. A special chapter has been written on surgical technic,

for the purpose of stressing certain details in preparation and after-treatment which vary to some extent from those described in works on general surgery. A thorough knowledge of these phases of treatment is a requisite to success. To avoid constant repetition, chapters have been included on apparatus and on surgical approaches; repeated reference is made to these chapters. The after-treatment is given in detail for practically all operative technics. This is a most essential, yet too often neglected, factor in the success of any surgical treatment.

In giving the position or range of motion of a joint, only one system has been followed: with the exception of the ankle and wrist, the joint is in neutral position when parallel with the long axis of the body in the anteroposterior and lateral planes. As the joint proceeds from the neutral position in any direction, the number of degrees in which such movement is recorded decreases progressively from 180 to 170, 160, and so on, to the anatomic limit of motion in that particular direction. To illustrate, complete extension of the knee is 180 degrees; when the joint is flexed 30 degrees, the position is recorded as the angle formed between the component parts of the joint, i.e., the leg and thigh, or 150 degrees. Flexion to a right angle is 90 degrees, and full flexion 30 degrees. In the wrist, the joint is at 180 degrees, or in the neutral position, when midway between supination and pronation, and flexion and extension. In the ankle joint, motion is recorded as follows: the extreme of dorsiflexion, 75 degrees; right angle, 90 degrees; and the extreme of plantar flexion, 140 degrees.

In some instances, the exact end results have been given, to the best of our knowledge. So many factors are involved in any one condition, that a survey of end results can be of only questionable value unless the minute details of each case are considered. Following arthroplasty of the knee, for example, one must consider the etiology, pathology, position of the ankylosed joint, the structure of the bones comprising the joint, the distribution of the ankylosis, and the age of the patient, in estimating the end result in each case. Further, a true survey should include the results of *all* patients treated over a period of *many* years, and should be made by the surgeon himself, rather than by a group of assistants, or by correspondence.

In our private clinic and the hospitals with which we are associated, a sufficient amount of material on every phase of orthopedic surgery has been accumulated dur-

ing the past twenty years or more to justify an evaluation of the various procedures. From this personal experience, we also feel that definite conclusions may be drawn in regard to the indications, contraindications, complications, and other considerations entering into orthopedic treatment. In all surgical cases, mature judgment is required for the selection of the most appropriate procedure. With this in mind, the technics which have proved most efficient in the author's experience have been given preference in the text. In addition, after a comprehensive search of the literature, operative measures have been selected which in the judgment of the author are most practicable.

Although no attempt has been made to produce an atlas of orthopedic surgery, an effort has been made to describe those procedures which conform to mechanical and physiologic principles and will meet all individual requirements. In any work of this nature, there are sins of omission; also, many surgeons in the same field may arrive independently at the same conclusions and devise identical procedures. We have endeavored, however, to give credit where credit was due. If there are errors, correction will gladly be made. In some of the chapters we

have drawn heavily from authoritative articles on special subjects; the author gratefully acknowledges his indebtedness for this material. He also wishes to thank those authors who have so graciously granted permission for the reproduction of original drawings.

In conclusion, I cannot too deeply express my sincere appreciation and gratitude to my associate, Dr. Hugh Smith, who has untiringly and most efficiently devoted practically all of his time during the past two years to collaboration with me in the compilation and preparation of material, which alone has made this work possible. I also desire to express appreciation to Dr. J.S. Speed for his collaboration on the sections on Spastic Cerebral Paralysis and Peripheral Nerve Injuries to Dr. Harold Boyd for anatomic dissections verifying all surgical approaches described, and for his assistance in preparing the chapter on this subject; to Dr. Don Slocum for his aid in the preparation of the chapter on Physiology and Pathology; to Mrs. Allene Jefferson for her efficient editorial services, and to Mr. Ivan Summers and Mr. Charles Ingram for their excellent illustrations.

Willis C. Campbell  
1939

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PART

**IX**

## **TRAUMATIC DISORDERS OF JOINTS**



# CHAPTER 32

## Ankle Injuries

S. TERRY CANALE

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Other than fractures or dislocations, trauma produces affections of joints in at least three ways: (1) acute severe ligamentous injuries with joint disruptions, (2) ligamentous injuries of lesser magnitude from a single episode or from repetitive "overuse" producing nondisruptive and microscopic abnormalities of the joint, and (3) aggravation of preexisting joint abnormalities. Also there are conditions for which trauma may have been a cause but in which the history is nonspecific and symptoms of injury have subsided, for example, chondromalacia or osteochondritis dissecans of the ankle. Miscellaneous affections of joints probably not caused by trauma but possibly aggravated by athletic, recreational, or occupational activities are discussed in Chapter 41.

### ACUTE LIGAMENTOUS INJURIES

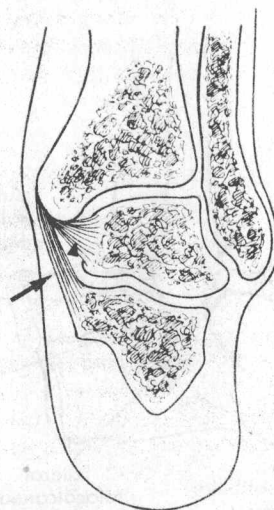
Soft tissue injuries of the ankle joint occur as minor ligamentous injuries (type I sprain), incomplete ligamentous injuries (type II sprain), or complete disruption of the ligament or ligaments (type III sprain).

Eversion and abduction of the foot may result in disruption of the deltoid ligament, whereas inversion stress may cause ligamentous disruption on the lateral side of the ankle. Diagnosis and treatment depend on an understanding of the ligamentous and muscular structures about the ankle.

### Anatomy

Stabilizing the medial side of the ankle both anteriorly and posteriorly is the strong, flat, triangular deltoid liga-

ment consisting of five components. The deep portion of the deltoid ligament is probably the most important and attaches to the undersurface of the medial malleolus and the body of the talus (Fig. 32-1). The superficial portion of the deltoid ligament consists of the other four components: the tibionavicular and anterior talotibial anteriorly, the calcaneotibial in the middle, and the posterior talotibial component posteriorly.



**Fig. 32-1** Coronal section through tibiotalar joint. portions of deltoid ligament are indicated by arrow and arrowhead. (Redrawn from Goergen TG et al: J Bone Joint Surg 59-A:874, 1977.)