THE ARTHRITIC FOOT and Related Connective Tissue Disorders

IRVING YALE, D.P.M., Ed. D. (Hon.)
JEFFREY F. YALE, D.P.M.

THE ARTHRITIC FOOT and Related Connective Tissue Disorders

Editor: Jonathan W. Pine, Jr.
Copy Editor: Perry Ewell
Design: Jim Mulligan
Illustration Planning: Lorraine Wrzosek
Production: Carol Eckhart

Accurate indications, adverse reactions, and dosage schedules for drugs are provided in this book, but it is possible that they may change. The reader is urged to review the package information data of the manufacturers of the medications mention.

Made in the United States of America

Library of Congress Cataloging in Publication Data

Yale, Irving.
The arthritic foot and related connective tissue disorders.
Bibliography: p.
Includes index.
1. Foot—Surgery. 2. Arthritis—Surgery. I. Yale, Jeffrey F. II. Title. [DNLM: 1. Foot diseases. 2. Arthritis. WE 880 Y17a]
RD563.Y327 1984 616.7'22 83-12466
ISBN 0-683-09314-2

Composed and printed
in the United States of America

"I wish to live deliberately, to front only the essential facts of life, and see if I could not learn what it had to teach, and not, when I came to die, discover that I had not lived."

HENRY DAVID THOREAU

THE ARTHRITIC FOOT and Related Connective Tissue Disorders

IRVING YALE, D.P.M., Ed.D. (Hon.)

Past President, American Podiatry Association
Former Chairman, Council on Podiatry Education
Past President and Fellow, American College of Foot Radiologists
Professor of Podiatric Medicine, Ohio College of Podiatric Medicine, Cleveland, Ohio
Associate Fellow, American College of Foot Surgeons
Former Chief, Podiatry Clinic, Orthopedic Department, Surgical Section, Yale-New Haven Medical Center, New Haven, Connecticut
Author, Clinical and Roentgenological Interpretations In the Lower Extremities—1952
Co-Author, Clinical Foot Roentgenology— First Edition 1966, Second Edition 1975, Spanish Edition 1978
Author, Podiatric Medicine—First Edition 1974, Spanish Edition 1978, Second Edition 1980
Member, American Medical Writers Association
Fellow, American Public Health Association
Consultant La Escuela de Podologos de la Facultad le Medicina de Barcelona, Spain, 1975–1980
Medal of Honor, Town Council of Paris, International Society of Podology

JEFFREY F. YALE, D.P.M., F.A.C.F.S.
Editor
Author to Chapter 15: Surgical Approach

Diplomate, American Board of Podiatric Surgery; Diplomate, American Board of Podiatric Orthopedics; Fellow, American College of Foot Surgeons; Fellow, American Academy of Podiatric Sports Medicine; Attending Podiatrist, Podiatry Section, Department of Surgery, Griffin Hospital, Derby, Connecticut; Associate Clinical Professor, University of Osteopathic Medicine and Health Sciences, College of Podiatric Medicine and Surgery, Des Moines, Iowa; Director of Yale Podiatry Group, Ansonia, Connecticut; Consultant, Podiatric Section, Surgical Service, Veterans Administration Medical Center, West Haven, Connecticut; Author, Firm Footings for the Athlete—1981

SANS TACHE

WILLIAMS & WILKINS
Baltimore/London

To my grandsons
Brian, Andrew, Justin and Dylan, with all my love.

Preface

The joints in the human foot are not unlike the joints in other parts of the body relative to their ultrastructural collection of cells and tissues. However, the gravitational forces necessary for weightbearing and function create their particular influence on the joints of the pedal extremities. Conversely, the influence of structural deformity, physiological dysfunction, and disease processes result in abnormal stresses on the feet that are not readily reversible. It can be postulated with a high degree of accuracy that very few systemic diseases and disorders develop without having some minor or major influence upon the structure and function of the human foot. Arthritis in its infinite variety of types and complications is one of these diseases. Needless to say, each of the arthritic diseases develops its own subjective and objective findings in the feet, requiring specialized diagnosis and podiatric treatment.

The symptoms of arthritis in the human foot are related to connective tissues intimately involved with joint structure and function. This text will therefore be concerned with the biologic and biochemical composition of the structures entering into the joints, the types of joints in the foot, the physiologic and pathological processes that provide for the integrity of the joint, and the influence of biomechanical dysfunction on the arthritic foot. Podiatric concern for the arthritic patient embodies close cooperation and consultation with the rheumatologist, internist, and family practitioner in the early diagnosis and systemic and podiatric treatment of the acute and chronic sequela of the disease.

It is my desire in this text to convey to the reader the nature of the foot problems experienced by the arthritic patient, the systemic and local manifestations of the disease process and their treatment by podiatric medical, biomechanical, pharmacologic, and surgical techniques. I trust the podiatric specialist, other physicians, and the student will find this text helpful as an adjunct source of reference, as well as a meaningful contribution to the literature.

It is the podiatrist's desire to join the team of specialists in rheumatology and to assist in the early diagnosis and treatment of acute and chronic foot disorders secondary to disabling and often life threatening arthritic disease.

It is important for the podiatrist and other specialists to consider the psychosocial character of the arthritic patient when administering treatment. The painful arthritic foot may be the "trigger" that can result in social withdrawal of the patient. Discomfort and disability may provide a means of escape from the realities of life. Lifestyles will change with the somatic problems associated with arthritis. The inevitable chronicity of pain creates problems at every life cycle, making it difficult to cope with peer relationships and career decisions. When youngsters, through adolescence, are crippled and in pain, the problems are often magnified by the outpouring of parental love and sympathy. Care should be exercised by the doctor in such cases to maintain a positive perspective and approach to the influences of the patient's environment.

Concern must be demonstrated for family fears and, if possible, group therapy for

families and close associates should be encouraged. The help of a psychologist can be a positive approach to orienting families to the problems by teaching both patient and loved ones how to cope with stress and by setting treatment goals for patient, family, and friends.

Chronic pain will alter the arthritic patient's relationship to sexual expression. The disabling arthritic problem manifests itself psychosomatically by changing the physiologic and psychological expressions of one's sexual life. There must be recognition that the successful management of the arthritic patient crosses the paths of many disciplines, requiring the expertise of a variety of health professionals.

Unfortunately, the practical application of diagnosis and treatment of arthritis has been clinical for too many years. Today and in the recent past there are scientists who are devoting their laboratory studies to the composition, cellular physiology, and chemical reactions taking place in the articular tissue in health and disease. Many interesting and constructive findings are being discovered involving the biological, biochemical, biomechanical, and pathological joint tissue. This is the direction we must follow if we are to provide the greatest benefit to the arthritic patient.

Due to the great influence of weight-bearing and multiple minimal trauma to its structure, the arthritic foot is categorized as an organ subject to the wear and tear of everyday living. It becomes readily apparent that the clinician finds it comfortable and easy to dismiss the symptoms of arthritis in the foot as of traumatic origin or as a degenerative joint disease. His treatment fits the clinical diagnosis with absolute confidence of a righteous plan of attack. Little is considered of the biochemical disparity involving the articular cartilage, synovia, synovium, capsular, and periarticular tissues. Little thought is given to the specificity of treatment to combat the exciting agents at the cellular, molecular, and genetic engineering level for a conclusive result.

Evans (1979) states that, "hard scientific data are now finding their way into the literature. We might proceed to the chemical drawing board to devise the appropriate compounds to specifically affect the mechanism by which the joint is irretrievably damaged."

The author respects the strides made in understanding the biomechanical and pathological alterations in bone. However, the true appreciation of the mechanism of joint change is taking place on the cellular and molecular research level. It is at these levels that significant future progress will be made. We all humbly look forward to scientific research in this area.

Irving Yale, D.P.M., Ed.D. (Hon.)

Acknowledgments

The following doctors and educators have made major contributions to this text by kindly providing many illustrations and photomicrographs of special interest.

Gene Potter, D.P.M., Ph.D., Director of Department of Pathology, New York College of Podiatric Medicine, New York, New York

Daniel J. McCarthy, D.P.M., Ph.D., Chief Podiatric Section, Surgical Service, Veterans Administration Medical Center, Baltimore, Maryland

Steven J. Berlin, D.P.M., Diplomate American Board of Podiatric Surgery, Director Podiatric Pathology Laboratory, Baltimore, Maryland

Martin Mussman, D.P.M., Chief Podiatric Section, Surgical Service, Veterans Administration Medical Center, Montrose, New York

Joyce Monochina, R.T., Department of Radiology, Ohio College of Podiatric Medicine, Cleveland Foot Clinics, Cleveland, Ohio

Raymond K. Locke, D.P.M., Diplomate American Board of Podiatric Surgery, Associate Clinical Professor U.S.C. Medical Hospitals, San Diego, California

Gerald Gorecki, D.P.M., M.P.H., Chief Podiatric Section, Surgical Service, Veterans Administration Medical Center, West Haven, Connecticut

S. W. Balkin, D.P.M., Diplomate American Board of Podiatric Surgery, Pasadena, California

Pathology Department, New York College of Podiatric Medicine, New York, New York

Armed Forces Institute of Pathology, Washington, D.C.

Steven Silverstein, D.P.M., Attending Podiatrist, Department of Surgery, Hospital of St. Raphael, New Haven, Connecticut

Abe Rubin, D.P.M., President Ohio College of Podiatric Medicine, Cleveland, Ohio

Marvin Shapiro, D.P.M., Past President American Podiatry Association, Toledo, Ohio

Michael A. Turlik, D.P.M., Associate Professor Ohio College of Podiatric Medicine, Cleveland Foot Clinics, Cleveland, Ohio

Allan Whitney, D.P.M., Professor of Orthopedics, Pennsylvania College of Podiatric Medicine, Philadelphia, Pennsylvania

Mark Gventer, D.P.M., Chairman Department of Radiology, New York College of Podiatric Medicine, New York, New York

Aaron Glockenberg, D.P.M., Podiatric Section, Surgical Service, Veterans Administration Medical Center, Montrose, New York

Mildred Dixon, D.P.M., Chief Podiatric Section, Surgical Service, Veterans Administration Medical Center, Tuskegee, Alabama

Eugene Kone, Consultant, Science Public Relations, Rockefeller University, New York, New Haven, Connecticut

Arthur Steinhardt, D.P.M., Chairman Department of Medicine, New York College of Podiatric Medicine, New York, New York

Mark A. Brenner, D.P.M., Chief Podiatry Service, Albert Einstein College of Medicine, New York, New York

Nancy Silverstein, D.P.M., Consultant Jewish Home for The Aged, New Haven, Connecticut

Irving Block, D.P.M., Executive Director American College of Podiatric Radiologists, Miami Beach, Florida

Morris Haas, D.P.M., Fellow American College of Foot Orthopedists, President New Mexico Podiatry Society

Allan J. Greenberg, D.P.M., Associate, American College of Foot Surgeons, Succasunna, New Jersey

Joseph A. Luciano, M.S., Director Consulting Service, Wallingford, Connecticut

Julius Citron, D.P.M., Podiatric Section, Surgical Service, Veterans Administration Medical Center, Phoenix, Arizona

Michael Giannone, D.P.M., Diplomate American Board of Podiatric Surgery, Mount Kisco, New York

Many thanks to the Schering Corporation for permission to use illustrations from their "Special Art Series on the History of Arthritis Therapy"

Thanks also to Fred Ortoli, Jr., Seymour, Connecticut for his work in processing many of the illustrations from slides and Mark Johnson, D.P.M., for his invaluable help in reading the page proofs.

My special thanks and gratitude to Esther Morico who typed and prepared the final manuscript for publication under pressure and difficult circumstances and to Kevin Wakeham, D.P.M., who prepared the index for this text.

Thank you Jo-Ellen Yale, Ph.D., for reviewing the manuscript and advising me on the technical aspects of writing this text. To the rest of my family, Muffy Yale Press, and my dear wife Bernice, I love you all for your understanding and patience. Thank you Jeff for your chapter.

Bravo to the thousands of unnamed medical historians, scientists and clinicians who provided the knowledge and skills from generation to generation to make this volume possible.

It has been a pleasure to work with the production staff of Williams & Wilkins, who used their know-how to make this author's efforts more meaningful and productive. Thank you, Alice Reid, for your encouragement. This has been an arduous but pleasant experience, and I sincerely appreciate all the encouragement I have received from my colleagues.

Irving Yale

Dr. Irving "Skee" Yale (August 22, 1914—April 2, 1983) lived each day to its fullest. His life was built upon a personal philosophy that it was the responsibility of every person to contribute to the society in which he or she lived. He maintained that, without personal effort, society would cease to exist. His accomplishments project achievement in the interests of a better society through expanded knowledge and are an inspiration to all.

A close family friend described Dad as having a remarkable attitude toward life. Optimism was his hallmark. He was a "people person." His personal warmth, insight, eternal optimism, and ability to differentiate the "forest" from the "trees" lent his contributions greater significance. We will remember Irving Yale the individual and we will remember Irving Yale for his enduring gift to medical knowledge.

Since he has written more podiatric medical texts than anyone else in history, his last manuscript will serve as a memorial to the man and a legacy to all.

Jeffrey F. Yale, D.P.M., F.A.C.F.S.

Contents

CHAPTER 1

Epidemiology and Biochemical Considerations

EPIDEMIOLOGY

Volumes have been written on the subject of epidemiology and the biochemical reactions that are involved in the physiopathologic processes of arthritis. This chapter does not cover the myriad of biochemical reactions, but provides some information of importance to the doctor and patient suffering with an arthritic disorder.

An appreciation of the information embodied in this section hopefully will provide working material for the provision of a better service to the patient suffering with an arthritic foot complaint.

Recent epidemiological studies are discussed briefly and are followed by biochemical information of general value to the clinician. Further information relative to biochemical, cellular, and molecular considerations can be found throughout the text.

General Discussion

It is indeed interesting and also disappointing to find so little information in the literature relative to the arthritic foot when one considers that some of the earliest discoveries of arthritis were found in prehistoric man. The manifestations of arthritic diseases in their unique variety of pathology in America alone involve over 30 million people.

In the study of the skeletal remains of non-human animals and *Homo sapiens*, Minugh (1982) cites the work of Blumberg, Sokoloff, Fox, and others concerned with osteoarthritis. Large vertebrates, such as dinosaurs, hominids, and Neanderthal man, presented evidence of osteoarthritis disorders. Fox concluded that 1) "weight bearing plays a significant role in the development of osteoarthritis as evidenced by its restriction to larger mammals, and 2) among larger mammals the distribution of the disease throughout the skeleton may be explained in terms of species specific functional stresses, probably generated by locomotor specializations requiring excessive functional demands at certain joints, which in turn lead to degenerative disease in the participant bony elements." Podiatrists can accept this view by Fox as being particularly significant as they minister to the problems of structure and function affecting the feet of modern day man.

The disease is no respector of age and can affect children, the middle-aged, and the elderly. A high percentage of arthritic patients are either partially or totally disabled. Many occupations are etiologic for the development of arthritis. Multiple minimal trauma, direct blows, and environmental toxicities are capable of creating arthritic symptoms. Many of the early signs of arthritis occur in the feet. The failure to recognize early signs often results in the patient developing serious crippling and damaging joint problems that are not reversible (Figs. 1.1–1.3).

Since there are no specific "cure-all" medications or other techniques that provide 100% results for arthritic problems, the patient often falls prey to injudicious advice, inadequate treatment, and a great deal of quackery.

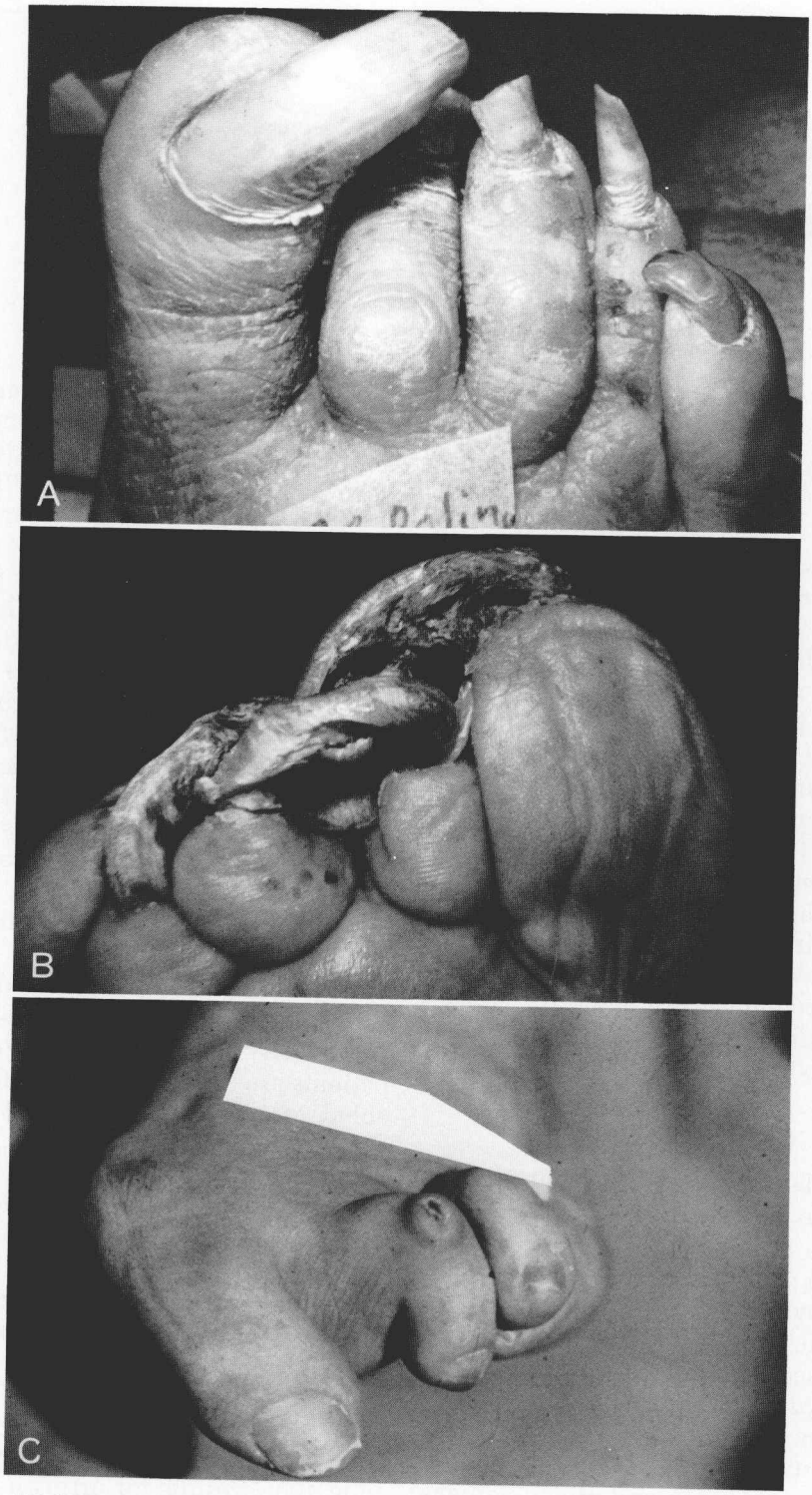

Figure 1.1. ARTHRITIC NEGLECT (*A–C*) The inability of the chronic arthritic to bend freely and move fingers and hands allows for poor foot hygiene. This is especially true when feet require palliative care and are neglected by the family. Professional attention is indicated when pathology exists.

Figure 1.2. CONGENITAL FOOT DEFORMITIES (*A* and *B*) Deformities subject the joints to severe trauma due to gravitational stress resulting in pain. Pain can be relieved by constructing sophisticated orthoses.

The authors of this text offer the practitioner a broad view of a variety of joint diseases affecting the human foot. Treatments discussed herein have been helpful in relieving discomfort and avoiding the crippling effects of the disease process. Nothing spectacular is offered to the practitioner. Hopefully, in the best interests of the suffering patient, one will recognize the need for a "team approach." The text

Figure 1.3. TALOCALCANEAL BRIDGE-FOREFOOT ADDUCTUS The inability of a joint to function normally results in abnormal stress being placed on adjacent articulations, often resulting in traumatic arthritis and deformity.

provides many approaches to the treatment of the arthritic foot based on proven results by the very people who are seeing the great bulk of foot problems in this country, the podiatrists. The author provides his expertise in the conduct of a successful practice over 40 years and many hundreds of thousands of pairs of feet.

Kraus et al. (1978), in an extensive epidemiological study that considered the drinking of alcohol, familial arthritis, genetic patterns, educational background, complications of obesity, the presence of osteoarthritis, smoking complications and participation in sports, concluded that those obese patients whose weight was at least 20% above ideal were at greater risk of developing osteoarthritis of the hip. Also, those who had a more than high school education and provided a family history of arthritis were at greater risk. There was no evidence of participation in high school athletics and regular use of alcohol increasing the risk of osteoarthritis.

FLOORING AT THE WORK PLACE

Brantingham et al. (1982, a and b) reference previous studies and statistics related to flooring at the work place. They note that the foot and leg are physiologically designed to function best on a varied terrain. The flat urban surface has been shown to reduce the efficiency of the venous pump mechanism and produce foot deformity. Venous circulation impedance tends toward the development of varicose veins and edema. Blood flow reduction is a concomitant of fatigue, and the fatigued worker is prone to injury at the work