Diagnosis and Management of Stroke and TIAs

Edited by

John Stirling Meyer, B.Sc., M.Sc., M.D., C.M.
and

Terry Shaw, Ph.D.

Diagnosis and Management of Stroke and TIAs

Edited by

John Stirling Meyer, B.Sc., M.Sc., M.D., C.M.
Professor of Neurology
Baylor College of Medicine
Principal Investigator,
Baylor Center for Cerebrovascular Research
Chief, Cerebrovascular Research,
Veterans Administration Medical Center
Houston, Texas

and

Terry Shaw, Ph.D.
Assistant Chief, Cerebrovascular Research
Veterans Administration Medical Center
Houston, Texas

ADDISON-WESLEY PUBLISHING COMPANY
Medical/Nursing Division • Menlo Park, California
Reading, Massachusetts • London • Amsterdam
Don Mills, Ontario • Sydney

Sponsoring Editor: Richard W. Mixter
Production Coordinators: Helene Harrington and Susan Harrington
Copyeditor: Suzanne Aboulfadl
Interior and Cover Design: Michael Rogondino

Library of Congress Cataloging in Publication Data
Main entry under title:
Diagnosis and management of stroke and TIAs.
(Clinical practice series)
Includes bibliographies and index.
1. Cerebrovascular disease. 2. Cerebral ischemia.
I. Meyer, John Stirling. II. Shaw, Terry. III. Series.
[DNLM: 1. Cerebrovascular disorders—Diagnosis.
2. Cerebrovascular disorders—Therapy. 3. Cerebral ischemia, Transient—Diagnosis. 4. Cerebral ischemia, Transient—Therapy. WL 355 D534]
RC388.5.D495 616.8'1 81-10926
ISBN 0-201-04184-7 AACR2

ABCDEFGHIJ-MA-89876543210

Addison-Wesley Publishing Company
Medical/Nursing Division
2725 Sand Hill Road
Menlo Park, California 94025

Publisher's Foreword

The Clinical Practice Series provides current clinical information in a practical and accessible format. Each title in the series addresses an important topic in modern primary care medicine. Essential pathophysiology is presented in the context of clinical material; the emphasis is always on sound diagnosis and management. Recommendations on when to refer are often included.

Clinical Practice Series authors are authoritative clinicians from a variety of distinguished medical centers. Each manuscript receives extensive critical review and commentary from our consulting physicians, many of whom have worked with us to develop the editorial goals and design of the series.

The format of this volume provides direct access to information on two levels—quick reference and in-depth study. Open the book to the beginning of any chapter. Brief chapter contents guide you to the topics of immediate interest. The chapter overview summarizes the chapter's content and purpose. Marginal notes distill facts and opinions from the text and offer critical commentary when appropriate. Tables and figures summarize data and provide quick visual references. No other series offers such accessibility to practical information and comprehensive coverage of clinically important topics.

Look for these published and immediately forthcoming volumes in the Clinical Practice Series:

PUBLISHED

Clinical Psychiatry in Primary Care
Diagnosis and Management of Stroke and TIAs
Diagnosis and Management of Pulmonary Disease
Infectious Diseases in General Medical Practice
Perinatal Medicine: Practical Diagnosis and Management
Practical Rheumatology: Diagnosis and Management
The Practice of Preventive Health Care
Psychosocial Aspects of Medical Practice: Children and Adolescents
Skin Diseases: Diagnosis and Management in Clinical Practice
To Make The Patient Ready for Anesthesia: Medical Care of The Surgical Patient

FORTHCOMING

Behavioral Medicine in General Medical Practice
Diabetes Mellitus: Problems in Management
Diagnosis and Management of Cancer
Diagnosis and Management of Obstetrical Emergencies
A Family Approach to Health Care of the Elderly
A Physician's Guide to Coronary Heart Disease Prevention
Practical Rehabilitation Medicine
Psychosocial Aspects of Medical Practice: Adults and The Elderly

Contributors

Henry J. M. Barnett, M.D., F.R.C.P.(C)F.A.C.P.
Professor and Chairman, Department of Clinical Neurological Sciences, University of Western Ontario, London, Ontario, Canada

Herbert I. Goldberg, M.D.
Neuroradiologist, Department of Radiology, Hospital of the University of Pennsylvania, Professor of Radiology, University of Pennsylvania, Philadelphia, Pennsylvania

Martin Grabois, M.D.
Associate Professor and Chairman, Department of Physical Medicine and Rehabilitation, Baylor College of Medicine, Houston, Texas

Joseph Jankovich, M.D.
Assistant Professor of Neurology, Baylor College of Medicine, Houston, Texas

William A. Kannel, M.D., M.P.H., F.A.C.P., F.A.C.C.
Professor of Medicine, Chief, Preventive Medicine and Epidemiology, Boston University School of Medicine, Boston, Massachusetts

Robert Levinthal, M.D.
Assistant Professor of Neurosurgery, Baylor College of Medicine, Houston, Texas

Peggy E. Malone, M.A.
Supervisor of Speech Pathology, Veterans Administration Medical Center, and Clinical Instructor, Baylor College of Medicine, Houston, Texas

Charles H. McCollum, M.D.
Associate Professor of Surgery, Baylor College of Medicine, Houston, Texas

John Stirling Meyer, M.D.
Chief, Cerebrovascular Research, and Director, Stroke Center, and Professor of Neurology, Baylor College of Medicine, Veterans Administration Medical Center, Houston, Texas

Albert E. Raizner, M.D.
Associate Professor of Medicine, Baylor College of Medicine, and Director, Cardiac Cetheterization Laboratories, The Methodist Hospital, Houston, Texas

Terry Shaw, Ph.D.
Assistant Director, Stroke Center, Veterans Administration Medical Center, Houston, Texas

Jean M. Whitehead, M.A.
Speech/Language Pathologist, Veterans Administration Medical Center, Houston, Texas, and Instructor, Baylor College of Medicine, Houston, Texas

Philip A. Wolf, M.D.
Professor, Department of Neurology, Boston University School of Medicine, Boston, Massachusetts

Preface

Medical knowledge and practice change rapidly these days. Probably the best known of these changes has been the introduction of computerized cerebral tomography (CT scanner). This three-dimensional x-ray scanner can noninvasively detect cerebral lesions as small as 1 cm^3, which has revolutionized the diagnosis of stroke.

A quieter revolution has been going on due to successful prevention of strokes. Despite our aging population, the incidence of stroke morbidity has been steadily declining for the past two decades. This may be attributed primarily to control of risk factors, particularly early detection and control of hypertension.

Knowledge of transient ischemic attacks (TIAs) as warning symptoms of strokes has become extensive, and there have been numerous prospective clinical trials of the natural history of TIAs, arteriographic findings, and effects of various medical and surgical interventions. We now know that a small, daily oral dose of aspirin decreases the incidence of TIAs and strokes, and we know what to expect as acceptable morbidity and mortality for surgical procedures such as carotid endarterectomy and extracranial-intracranial (STA-MCA) bypass.

Much knowledge has been accumulated on the diagnosis, natural history, and medical and surgical therapy of acute ischemic and hemorrhagic strokes. Knowledge of the aging process itself has increased, and we now know how various changes in the aging brain can contribute to stroke symptomatology.

All authors in this text were selected and invited to contribute because of their expertise, extensive clinical experience, and

demonstrated ability to teach and communicate concisely. It is interesting to note the general conformity of opinions among authors dealing with widely different aspects of cerebrovascular disease, despite some biases as a result of their special interests and patient experiences weighted according to their referral practice. Minor differences for cited incidences and prevalences of stroke and TIA morbidity, mortality, and disability may be accounted for by differences in the time of the study quoted and in methodologic differences in studying the population groups. Nevertheless, there is conformity of facts and opinions regarding stroke treatment and prevention (even though these facts and opinions were derived from diverse disciplines and clinical experience).

The family practitioner, obstetrician and gynecologist, internist, and general practitioner have been identified as the usual first-contact physicians to whom the patient at risk from stroke will report. With these readers in mind, this book provides practical and relevant information for the care of patients with or at risk from stroke.

The chapters are designed to interrelate; a certain amount of repetition from chapter to chapter are inevitable but will be helpful for several reasons. From a pedagogical point of view, emphasis of similar points within different contexts is known to be a useful teaching strategy. For example, in this text neurologists, internists, general surgeons, neurosurgeons and physiatrists and psychologists discuss the prevalence of stroke and preventive measures from their own perspectives, experiences and practices, emphasizing the common goal: preventing this major cause of death and disability in the United States.

- Chapter 1 discusses recent knowledge concerning the relationship between normal aging and cerebral blood flow, and compares the implicit age-relationship to the incidence of cerebrovascular disease.

- Chapter 2 includes new material from data of the Framingham study, in which a representative population from Framingham, Massachusetts, has been checked for cardiovascular manifestations for three decades. Well-established major risk factors that predispose otherwise healthy individuals to stroke are hypertension, cardiac disorders, and diabetes mellitus. Minor risk factors include hyperlipidemia (hypertriglyceridemia and/or hypercholesterolemia), obesity, polycythemia, erythrocythosis, and a

family history of stroke. Possible relationships of stroke to cigarette smoking and physical activity are also discussed. Evidence for more controversial risk factors such as alcohol and/or coffee ingestion and the use of oral contraceptives are reviewed. Evidence is cited that early intervention has already proven to be effective in preventing stroke. Future prospects for improved stroke prophylaxis are considered.

- In Chapter 3, some practical guidelines are outlined for the primary care practitioner at the time of his or her first contact with the stroke patient. The term *stroke* is defined and different types of stroke are described, including detailed descriptions of transient ischemic attacks as warnings of threatened stroke. The anatomy, symptomatology, and pathology of different stroke syndromes are reviewed.
- Chapter 4 reviews the critical importance of modern neuroradiologic techniques in the diagnosis and therapeutic evaluation of stroke. CT patterns of ischemic infarction, hemorrhagic and embolic infarction, and lacunar strokes are defined. CT signs of neurologic emergencies, such as cerebral herniation and cerebellar hemorrhage, are reviewed. The important role of cerebral angiography in providing essential anatomic information for surgical intervention is discussed.
- Chapter 5 updates current medical therapy of TIAs through the use of drugs that inhibit platelet aggregation. This chapter is based on extensive clinical trials carried out by the author and collaborators. It gives an authoritative account of the pathogenesis, incidence, and prognosis of TIAs. All causes of TIAs are reviewed, their relative frequency is cited, and the decreasing indications for anticoagulant therapy are discussed.
- Chapter 6 discusses the course, prognosis, and medical management of patients with acute stroke. This chapter presents recent data concerning the enormous financial burdens of all aspects of acute stroke care in the United States. A practical clinical classification of stroke, differential diagnosis and useful prognostic indicators are described. Laboratory tests that may be of use to the primary care physician are discussed along with guidelines for when it is appropriate to seek neurosurgical and cardiovascular surgical consultation. Also in this chapter are discussions of nursing and general medical care of stroke patients, and the limited value of cerebral vasoactive therapy. Medical treatment of cerebral edema is reviewed in light of clinical and experimental trials of this form of treatment.

- Chapter 7 discusses the anatomy and pathology of extracranial vascular occlusive disease in relation to the production of cerebral symptoms. The role of the cardiovascular surgeon in the surgical treatment of extracranial vascular disease is reviewed and a clinical classification of patients likely to benefit from surgical intervention is presented. Laboratory tests, including Doppler ultrasonography, are discussed as are angiographic findings in typical cases and the recommended surgical techniques that may be utilized.
- Chapter 8 reviews the role of the neurosurgeon in the treatment of TIAs and subarachnoid hemorrhage. The importance of the operating microscope in improving operative morbidity and mortality is described and current indications and results of neurosurgical treatment by extracranial-intracranial bypass procedures, intracranial clipping of aneurysms, and excision of arteriovenous malformations are reviewed.
- Chapter 9 provides a complete and detailed discussion of the lifesaving importance of treatment of heart disease by an experienced cardiologist for patients with stroke.
- Chapter 10 reviews rehabilitation and physical therapy in stroke patients, and Chapter 11 provides an overview of current concepts of the clinical classification of speech disorders and the scientific basis for different approaches to speech rehabilitation and therapy.

ACKNOWLEDGMENTS

Acknowledgments for continuing research support are made to the National Institutes of Health, National Institute of Neurological and Communicative Diseases and Stroke, The National Heart, Lung, and Blood Institute of the United States Public Health Service, and the Canadian and Ontario Heart Foundations. This work was also supported by the Veterans Administration in collaboration with Baylor College of Medicine.

John Stirling Meyer
Terry Shaw

Contents

1 Aging and Cerebrovascular Disease

Terry Shaw — Terry Shaw is an experimental and clinical neuropsychologist with expertise in clinical experimental design and computer analysis. He was trained in the Department of Psychology at the University of Houston and in the Cerebral Blood Flow Laboratory and cerebrovascular research programs of the VA Medical Center, Houston, and Baylor College of Medicine. His major interests are the differential effects of aging on brain-behavior relationships.

John Meyer — John Meyer is a neurologist with special interests in cerebrovascular disease and measurement of cerebral blood flow and metabolism. He is director of the Stroke Center at Veterans Administration Medical Center, Houston, and a Professor of Neurology at Baylor College of Medicine.

Brief Contents

Overview

Chronologic aging is an important consideration with regard to cerebrovascular disease. Aging and coincidental appearance of cerebrovascular disease result in behavioral and physiologic changes. Distinctions between normal aging and disease-related events should be stressed. Cerebral blood flow (CBF) measurements indicate that there are measurable but minor changes in cerebrovascular function associated with normal aging, which become exaggerated in the presence of risk factors and/or symptoms of cerebrovascular disease. There has been controversy whether the reduction of