

Toole's Cerebrovascular Disorders, Sixth Edition

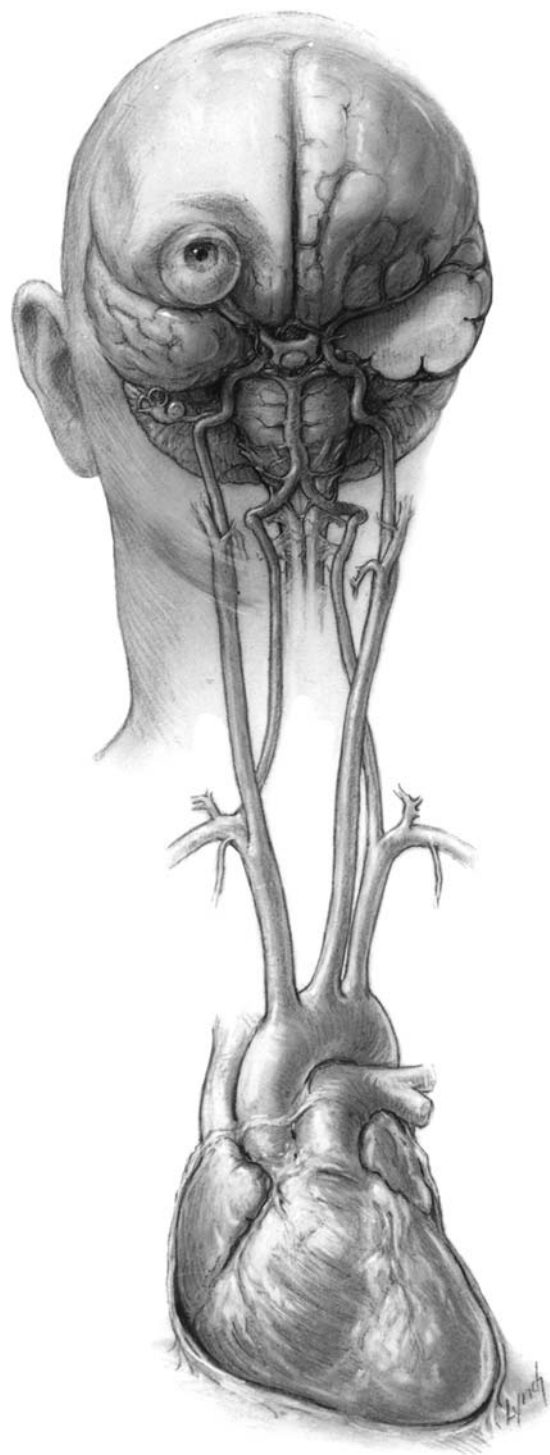
Toole's Cerebrovascular Disorders was the first modern book devoted to the care of stroke, originally published more than 40 years ago. Drs. E. Steve Roach, Kerstin Bettermann, and José Biller have completely revised and updated this sixth edition of the highly respected standard for stroke diagnosis and treatment, adding chapters on genetics, pregnancy-related stroke, and acute treatment. The practical focus of the book has not changed, retaining its emphasis on bedside diagnosis and treatment. Easily accessible for both stroke specialists and residents, this sixth edition has been modernized to keep pace with the rapid expansion of knowledge in stroke care and includes evidence-based recommendations, the latest technology and imaging, and risk factors. The text is supplemented with more than 200 images, many in color.

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E. Steve Roach, Kerstin Bettermann and Jose Biller
Frontmatter
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*What is the hardest of all? What you as easiest would deem
To see with your eyes, what lies before your eyes.*
Johann Wolfgang von Goethe

TOOLE'S
Cerebrovascular Disorders,
Sixth Edition

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Every effort has been made in preparing this book to provide accurate and up-to-date information that is in accord with accepted standards and practice at the time of publication. Although case histories are drawn from actual cases, every effort has been made to disguise the identities of the individuals involved. Nevertheless, the authors, editors, and publishers can make no warranties that the information contained herein is totally free from error, not least because clinical standards are constantly changing through research and regulation. The authors, editors, and publishers therefore disclaim all liability for direct or consequential damages resulting from the use of material contained in this book. Readers are strongly advised to pay careful attention to information provided by the manufacturer of any drugs or equipment that they plan to use.

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We dedicate this book to
Lisa Hyde Roach
Wolfram, Katherine, and Sebastian Bettermann
Rhonda T. Biller

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Foreword

I am honored that three such highly authoritative stroke neurologists have produced the sixth English edition of what began at Wake Forest in 1964 as a collaboration with my research Fellow, Aneel Patel. Our goal was to summarize the nascent field by writing the first textbook devoted solely to the prevention, diagnosis, management, and rehabilitation of stroke, emphasizing transient ischemic attacks – then a new concept. At that time there were no stroke journals or texts devoted solely to the topic even though stroke was already becoming recognized as a leading cause of disability and death worldwide.

We reviewed anatomy, physiology, patient presentation and examination, differential diagnosis, management, and rehabilitation. In those days our equipment was a detailed history, a reflex hammer, a tuning fork, a wisp of cotton, and a pin. We adopted the stethoscope as well as ophthalmoscope for neurologic use. There were few useful neurodiagnostic tests. Before ultrasound, computed tomography, computed tomography angiography, magnetic resonance imaging, and SPECT, we used skull X-rays to determine displacement of the calcified pineal gland because it was thought too daring to do an arteriogram. The prevailing attitude was “There is no treatment for stroke, so what purpose do dangerous studies serve?” I took the opposite view – that severe carotid stenosis, even if still asymptomatic, deserved medical and perhaps surgical intervention and that atherosclerosis could be stabilized and in some cases even reversed. At that time these were bold theories and actions. Gradually, of course, attitudes about stroke care have changed, and we have evolved from a largely intuitive approach to a more evidence-based mentality that is made possible by years of study and painstakingly completed multicenter clinical trials.

Dr. Richard L. Masland, previously at Wake Forest University and subsequently Director of the National Institute of Neurologic Diseases, along with Dr. Murray Goldstein designed and implemented the stroke portion of President Lyndon Johnson’s so-called War on Heart Disease, Cancer, and Stroke. Our medical center subsequently became the third in the nation to be designated a stroke center. Over time we attracted a number of extraordinarily talented people,

including Dr. Lawrence McHenry, a medical historian who helped to develop cerebral blood flow measurement; Dr. William M. McKinney, who led the charge in developing and promoting ultrasound as a noninvasive neurovascular imaging tool; Dr. Richard Janeway, who rose to become dean of our medical college; and Dr. David Good, a neurorehabilitation specialist who has contributed to the last several editions of this book. Assisted by Diane C. Vernon and Ralph Hicks, we participated in the formation of national and international stroke societies and the editing of journals and texts, which have resulted in worldwide attention to this dread disorder – stroke.

We also attracted exceptional people for training, among them all three authors of this sixth edition of *Cerebrovascular Disorders*: E. Steve Roach, MD, a child neurologist specializing in stroke and genetics; Dr. José Biller, MD, a superb clinician and educator who focuses on stroke and cerebrovascular disorders; and most recently Kerstin Bettermann, MD, PhD, an expert in stroke and neurocirculatory physiology. I am proud to have influenced these and other outstanding colleagues, and as I leave the bedside for a more research-oriented life, I enthusiastically pass the baton to them as a team akin to that of Olympian Roger Bannister, neurocirculatory physiologist and neurologist, who electrified the world by doing the impossible – breaking the track barrier of the four-minute mile.¹ Of course, Bannister’s hard-earned track record was quickly surpassed, as will be, one hopes, our current achievements in the study of stroke.

The six editions of *Cerebrovascular Disorders* mirror to a large extent the changes in our understanding of stroke and its diagnosis, prevention, management, and rehabilitation over the last four decades. Each succeeding edition incorporated an increasing array of new diagnostic techniques and reflected a progressively more sophisticated understanding of stroke in all its forms and presentations, increasingly supported by experimental models and patient-centered clinical trials. As evidenced by the numerous new pathological specimens that illustrate this sixth edition, it retains the firm grounding in neuroanatomy and pathology that characterized the previous editions. Like the earlier editions, this one

strives to make the concepts that underlie stroke prevention, diagnosis, and management understandable to both clinicians and students. Moreover, this edition includes new developments in the prevention, diagnosis, and treatment of stroke, with new considerations of arterial dissection, genetic aspects, acute therapy, and vasculopathies as well as major updates of endovascular treatment, pathophysiology, technology, and primary and secondary stroke prevention. In the future, new concepts and methods will continue to accumulate, and so I applaud my author colleagues for providing a comprehensive, readable, and authoritative picture of what stroke care has become.

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Past President of the World Federation of Neurology
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REFERENCE

1. Bascomb N. *The Perfect Mile: Three Athletes, One Goal, and Less than Four Minutes to Achieve It*. Boston: Houghton Mifflin; 2004.

Preface

Although Gregor Nymmann and Johann Jakob Wepfer wrote books on apoplexy as early as the seventeenth century, it was James F. Toole's first edition of *Cerebrovascular Disorders* in 1967 that defined stroke as a field for study. It summarized what was then known about the anatomy, pathophysiology, diagnosis, and treatment of stroke in a fashion that was so clear, logical, and positive that it sparked in many of us a lifetime interest in the study of cerebrovascular disease.

Despite centuries of observation, much of what we now deem useful knowledge about stroke has been discovered in the four decades since the 1967 appearance of *Cerebrovascular Disorders*. Stroke was then mostly a diagnosis based on bedside examination, knowledge of brain and vascular anatomy, clinical experience, and intuition. Therapeutic nihilism was the order of the day. Cerebral angiography could confirm certain diagnoses, and echoencephalography was used to detect displacement of the midline by a subdural hematoma or large intracerebral hemorrhage. Confirmation of a clinical diagnosis was difficult and awaited autopsy in the days before the now-ubiquitous imaging studies. The ensuing years have seen the development of multiple neuroimaging methods, new surgical and endovascular techniques, and new and more effective forms of therapy. But perhaps the most important long-term development in stroke care during the last few years has been the results of randomized clinical trials that increasingly augment clinical decisions.

The first five editions of *Cerebrovascular Disorders* chronicled the evolution of the field and, in many instances, included innovations that led to change. Our aim in writing this sixth

edition is to maintain this tradition by creating a readily understandable and practical source of information about the prevention, diagnosis, and treatment of stroke to be a guide for experienced clinicians and trainees alike. It is our hope that ours as well as related books will continue to need updates, because, despite the extraordinary progress made, there is much still to discover and learn.

We thank some of the people who helped to create this book. Drs. David C. Good and Lumy Sawaki were kind enough to update their chapter on rehabilitation after stroke, and Dr. Toole contributed the first chapter on the history of the field. Artist George C. Lynch created numerous anatomical illustrations for the early editions, and some of these have been reused. We are particularly grateful for the unwavering editorial assistance provided by Lisa H. Roach, Ruth Vileikis, and Ralph Hicks with the help of Paula Griffin-Arnold, Linda Turner, and Gail White. Several colleagues provided illustrations or critiqued chapters, among them Nick Hogan, Louis Carragine, Dixon Moody, Geoffrey Heyer, and Sarkis Morales-Vidal.

In the interest of full disclosure, we should acknowledge that we three authors had the privilege of training with James F. Toole. As tempting as it might be to attribute any errors that may have crept into this book to gaps in our early training and subsequent mentoring, we alone are responsible for its content.

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