Introduction

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This issue of *Neurotherapeutics* is devoted to stroke. Although the chapters are organized similarly to a textbook (i.e., beginning with epidemiology and diagnosis, then moving to treatment, and ending with prevention), it is by no means intended to be an encyclopedic coverage of each area. Instead, I have instructed the authors to relate what they cover as much as possible to disease mechanisms and treatment, and as much as possible to link the 2 together. I have chosen authors who are young academicians who are making a mark in their respective fields by groundbreaking research, and in which a chapter is led by a senior author. I have encouraged co-authorship by emerging young academicians who might bring a fresh perspective to their assigned topic.

In chapter 1, Drs. Nguyen and Obviagele cover stroke epidemiology starting by pointing out the declining incidence and increasing prevalence of stroke, which results from improving implementation of stroke prevention across an ever aging population. Then they focus on racial, ethnic, gender, geographic, and socioeconomic factors. Next, they turn to how traditional risk factors inform us of stroke pathophysiology. They end with transient ischemic attack (TIA) and its relation to stroke.

Next, we turn to diagnosis, and in chapter 2, Drs. Liebeskind and Nour discuss how brain imaging provides “insight (into pathophysiology) beyond (mere) diagnosis.” After discussing the relative capabilities of computed tomography (CT) and magnetic resonance imaging (MRI), the authors focus on how imaging has changed our entire

approach to intracerebral hemorrhage, from the diagnosis of amyloid angiopathy, differentiating types of cerebral edema to predicting hemorrhage growth or hemorrhagic transformation. The chapter concludes with the controversial topic of imaging ischemic stroke, which is covered in more detail in chapter 8.

Recognizing that stroke is primarily a blood and blood vessel disorder, Drs. Alexandrov and Barlinn then cover vascular imaging in chapter 3, with a focus on comparing the advantages of angiography using MRI, CT, digital subtraction, and ultrasound. Then we turn to the blood in chapter 4, in which Drs. Sharp and Jickling discuss the exciting area of proteomic markers and RNA expression profiles; these provide pathophysiological clues to stroke diagnosis by identifying ischemic from hemorrhagic stroke, ischemic stroke subtype, duration of stroke, stroke deterioration, hemorrhagic transformation, and prognosis.

The next two chapters cover 2 common important clinical problems, which are receiving increasing scientific scrutiny. Vascular cognitive impairment is covered in chapter 5, in which Drs. Levine and Langa provide us with a definition and description of some of the varied pathologies and risk factors that lead to this diagnosis, and then cover treatment considerations, including prevention. In chapter 6, Drs. Gonzales and Sangha address intracerebral hemorrhage. They begin by discussing the genetics and racial disparities associated with ICH, the more common causes, how to recognize and treat hemorrhage expansion with an emphasis on blood pressure management, and then they discuss the myriad ways hemorrhage produces secondary injury, including inflammation, mass effect, and intraventricular extension finally covering emerging new pharmacologic and surgical treatments.

Next, we turn to thrombolytic treatment of acute ischemic stroke. In chapter 7, Dr. Barreto provides a thorough review of intravenous thrombolysis, beginning

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with the biology of clot formation and lysis. Barreto then describes the interesting history of the development of tissue plasminogen activator (t-PA) before thoroughly reviewing the various clinical trials and then ending with exciting new directions that will hopefully provide us with the ability to improve on the approach we have been using for the past 15 years.

In chapter 8, Dr. Abou-Chebl reviews intra-arterial therapy. He begins by reviewing the imaging criteria most commonly used for patient selection and then covers technical issues, such as anesthesia, blood pressure management, anticoagulation, endovascular approach, and the use of thrombolytic drugs and mechanical clot disruption.

The following chapters discuss treatment beyond thrombolysis. Drs. Samuels, Lopez, and Afshinnik cover stroke unit care and management of severe strokes, including cerebral edema and hemicraniectomy in chapter 9.

Then, in chapter 10, Drs. Kasner and Shali provide a thorough review of the management of specific stroke subtypes (i.e., cardioembolic, large artery and small artery strokes with a focus on antithrombotic therapy) and end with discussion of less common types of stroke, such as dissection, vasculitis, and venous thrombosis.

In chapter 11, Drs. Savitz and Sahota cover the broad issue of neuroprotection, focusing on those aspects currently furthest along in clinical testing, such as hypothermia, albumin, magnesium, and citicoline. Next, they thoroughly review the very active field of cell-based therapies.

Chapter 12 by Drs. Barrett and Ifekika-Jones turns to rehabilitation from stroke and ties biological mechanisms of

recovery and changes in brain circuitry to motor retraining, including the use of robotics and electrical stimulation. Then they cover the use of brain stimulation, constraint, and other approaches to treating aphasia, neglect, and apraxia.

The final 4 chapters focus on stroke prevention. In chapter 13, Drs. Uchino and Aoki first cover management of the “bread and butter” risk factors (hypertension, diabetes, lipids, and atrial fibrillation), and then turn to lifestyle changes (smoking, alcohol, diet, exercise, and obesity), and finish with a discussion of less certain areas of prevention, such as metabolic syndrome, lipoprotein a, obstructive sleep apnea, homocysteine, and thrombophilia.

Drs. Benavente and Yip then discuss antiplatelet drugs for secondary stroke prevention in chapter 14. The emphasis is placed on how stroke pathophysiology and subtype might affect the choice of agent.

Chapter 15 covers cardioembolic stroke, and Drs. Aguilar and Freeman first describe the various cardiac conditions that can lead to embolization. Then they discuss the various treatment options, both pharmacologic and interventional. They finish the chapter with a discussion of alternatives to warfarin that are now emerging on the market.

Finally, Drs. Chaturvedi and Rajmani tackle the issue of carotid endarterectomy and stenting in chapter 16. They review the expanding literature that is finally allowing us to tailor our therapy to the clinical characteristics of the specific patient.

We are confident that this collection of articles will provide readers with an up-to-date understanding of stroke management based on underlying pathophysiology.