

Circulation Research Compendium on Stroke

Introduction to the Stroke Compendium

Global Burden of Stroke
Cerebral Vascular Disease and Neurovascular Injury in Ischemic Stroke
Stroke Risk Factors, Genetics, and Prevention
Stroke Caused by Extracranial Disease
Stroke Caused by Atherosclerosis of the Major Intracranial Arteries
Cardioembolic Stroke
Cryptogenic Stroke: Research and Practice
Acute Ischemic Stroke Therapy Overview
Heart–Brain Axis: Effects of Neurologic Injury on Cardiovascular Function
Vascular Cognitive Impairment

Marc Fisher, Costantino Iadecola, and Ralph Sacco, Editors

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The field of cerebrovascular disease encompasses a broad range of disorders that range from ischemic stroke to hemorrhagic stroke to vascular cognitive impairment and the interactions between the heart and brain. Physicians, allied health professionals, and basic scientists from many different disciplines and backgrounds are interested in cerebrovascular disorders and contribute to the efforts to more fully understand the basic pathophysiology of cerebrovascular diseases, improve patient care, and develop novel therapies that will reduce the burden of these ubiquitous medical conditions. In designing this compendium for the readers of *Circulation Research*, the primary focus was on ischemic stroke, but it also includes articles related to the interaction between the heart and the brain, as well as the increasingly important area of vascular cognitive impairment. An impressive array of contributors agreed to participate, and we are truly honored to have articles by acknowledged thought leaders for each of the 10 topics covered by the compendium. We do acknowledge that the important areas of primary intracerebral hemorrhage and subarachnoid hemorrhage could not be discussed, but these topics should be considered for a future compendium.

Regarding the ischemic stroke field, the global burden of ischemic stroke is covered by Dr Feigin,¹ with updated

information about the incidence and prevalence of this disorder, as well as the temporal trends in the burden of stroke over an extended time period in developed and developing countries. Ischemic stroke is a medical condition without international borders and is of rising importance in many lower- and middle-income countries. The basic mechanisms of cerebral blood flow control, endothelial cell dysfunction, and blood brain barrier integrity/disruption are discussed by Faraci and Chen,² highlighting the similarity of basic mechanisms of ischemic disease in the brain, heart, and other organs. The relationship of stroke risk factors to the development of ischemic stroke is discussed by Elkind et al,³ and this article also demonstrates the substantial overlap of vascular risk factors between coronary artery disease and ischemic stroke. Several articles were commissioned to emphasize the heterogeneity of the most common causes of ischemic stroke. Extracranial large artery disease is discussed by Brott et al,⁴ with a focus on recent developments regarding the best approaches to the treatment of carotid artery stenosis in symptomatic and asymptomatic patients using endarterectomy or stenting. Chimowitz et al⁵ discuss the important topic of intracranial artery disease as a mechanism for the development of brain ischemia. Intracranial atherosclerosis is a particularly important problem in east Asia and a focus of therapy development in those populations. Cardioembolic stroke represents a key interaction between cardiologists and stroke neurology. Many mechanisms have been identified, but the most important one is nonvalvular atrial fibrillation, a field where much progress has been made in the development of novel stroke prevention strategies. Kamel and Healey⁶ provide an excellent overview of cardioembolic stroke mechanisms and current information about prevention approaches. The accurate identification of the most likely cause of an ischemic stroke has improved substantially over recent decades because of improved brain and vascular imaging, as well as improved detection methods for

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finding paroxysmal atrial fibrillation. Despite these advances, 25% to 30% of patients do not have an identified mechanism for their stroke and are called cryptogenic. Dr Furie et al⁷ provide an excellent overview of the potential explanations of cryptogenic stroke and how the evaluation of ischemic stroke patients for a potential cause should be conducted. They also discuss the recently suggested entity of embolic stroke of uncertain source and how it relates to cryptogenic stroke. The treatment of acute ischemic stroke has seen dramatic advances recently as exemplified by the publications of 5 clinical trials over a few months in a prominent medical journal that demonstrated the beneficial effects of endovascular therapy used within 6 hours of stroke onset in patients with proximal intracranial vessel occlusions who did not have extensive regions of brain already infarcted. The use of intravenous thrombolysis has also expanded over time and remains the most widely used acute stroke therapy worldwide. One of us, Marc Fisher, and colleagues⁸ provided an overview of the current status of intravenous and intra-arterial acute stroke therapy and projected how novel adjunctive therapies might enhance the benefits of these proven therapies. Drs Tahshi-Fahadan and Geocadin⁹ provide an overview of the many inter-relationships between the heart and the brain and how these 2 key organs affect one another. Finally, Drs Dichgans and Leys¹⁰ review the important topic of vascular cognitive impairment, an increasingly recognized contributor to the development of cognitive decline and dementia in our aging populations. The pathophysiology, diagnostic evaluation, and potential prevention and treatment strategies are described.

We hope that the readers of *Circulation Research* will find this series of articles primarily related to various aspects of ischemic stroke to be illuminating and thought-provoking. The fields of cardiology and stroke neurology share many commonalities and are ripe for close collaboration and interaction. The advances in the pathophysiology, prevention, and treatment of ischemic stroke and the other topics covered by this stroke compendium have transformed the way we care for stroke patients and led to great enthusiasm in the

cerebrovascular community. Momentum has built to accelerate these developments, and there are expanding opportunities of further breakthroughs as we collaborate with the cardiovascular research community to address the common field of vascular disorders of the heart, brain, and circulatory system.

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