

Preface

Working in stroke and critical care at a large academic medical center, I examine and study patients with large and small-vessel stroke, intracranial hemorrhage, hemodynamic compromise from carotid disease, and major cardiac conditions. Because of the nature of this setting, my colleagues ask questions less about the characterization of cognitive deficits and more about what causes them. After all, medical and surgical treatment is an institutional mission. And so I began to realize several things: First, behavior could be an index of disease severity and progression, pathophysiology, and treatment efficacy often more sensitive than physical signs and symptoms; and second, that factors involving the blood supply to the brain represent a common thread among many of the cognitive syndromes that are brought to my attention. The notion of *neurovascular neuropsychology* was borne out of this experience.

The goal of this book is to provide a model for neuropsychology, as a discipline, in which the investigational focus is as much on causal mechanisms as it is on the exquisite measurement of cognitive and behavioral outcomes. It seems to me that the intimate relationship between the brain and its blood supply provides a unique opportunity to expand the role of neuropsychological inquiry. The concentration here is on adult neurovascular conditions, leaving to others similar afflictions that concern children.

To this end, we first present an historical perspective, followed by a primer of neurovascular anatomy and the diagnostic modalities most frequently used to measure structural integrity. We then begin the journey along the continuum of neurovascular injury, starting first with the focal disease that encompasses ischemic and hemorrhagic stroke, and local vascular anomalies such as cerebral aneurysms and brain arteriovenous malformations. But focal disease spread across critical brain regions can also have a cognitive effect greater than the sum of affected tissue, disturbing more integrative functions such as mental speed and decision-making. In this regard, vascular dementia

and its precursor vascular cognitive impairment are discussed, as well as the consequences of the genetic mutations associated with CADASIL and MELAS. At a more macroscopic level, we progress to vascular hemispherical conditions in which there is obstruction of the carotid arterial system. We consider here both the direct effects of stenosis and occlusion, as well as the consequences of treatment, such as surgical bypass, and angioplasty and stenting. At the global level, we consider abnormalities of cardiopulmonary origin, examining cardiac arrest, congestive heart failure, cardiac surgery and pulmonary disease as pathophysiologies that have a significant cognitive impact on millions of individuals world-wide. There are also chronic systemic diseases and conditions, such as diabetes and hypertension, which affect cognition either by directly altering the structural nature of blood vessels or by providing the route of pathogenic dissemination in the blood supply. Sometimes entities, like collagen vascular diseases (e.g., systemic lupus), can do both. We also consider the high frequency and impact of mood disorders, particularly depression, on cognition and recovery in neurovascular disease.

But so as not to leave the reader without hope, it is also important to present the increasing recognition that the adult human brain is far more plastic than previously thought, and that an understanding of neurotransmitter systems and principles of brain reorganization is leading to new treatments and to greater expectations of recovery.

In the end, neurovascular neuropsychology is less a sub-specialty than an approach to our field. It broadens our purview into patient care by allowing us to ask questions about the physiologic reasons for behavioral change which are potentially treatable. For many of us, that is the reason why we entered this field in the first place.

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