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Cerebrovascular Disease

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INTRODUCTION

Stroke is a major public health problem throughout the world due to its high prevalence and mortality, and its association with significant disability even among survivors. Stroke is the fourth leading cause of death in the United States, and a leading cause of death in other countries, particularly in Asia. It is the leading cause of serious disability, and results in enormous costs measured in both health care dollars and lost productivity. Major strides have been made in understanding the epidemiology, etiology, and pathogenesis of cerebrovascular disease, which have led to new approaches to diagnosis and treatment.

DEFINITION AND EPIDEMIOLOGY

The term *cerebrovascular disease* encompasses a host of disorders that share pathology localized to the vessels of the brain and spinal cord, including ischemic stroke, transient ischemic attack (TIA), intracerebral hemorrhage (ICH), subarachnoid hemorrhage (SAH), cerebral venous and sinus thrombosis, and disorders of the vessels themselves unassociated with cerebral injury (Table 116-1). Strokes may also be classified as either ischemic (i.e., due to lack of blood flow) or hemorrhagic. With widespread use of sensitive brain imaging, such as diffusion-weighted MRI (DWI), cerebral injury from ischemia can be seen among patients whose symptoms last only a few minutes. A definition from an expert panel in 2013 defines an *ischemic stroke* as "an episode of neurological dysfunction caused by focal cerebral, spinal, or retinal infarction." A *stroke due to ICH* was defined as "rapidly developing clinical signs of neurologic dysfunction due to a focal collection of blood within the brain parenchyma or ventricular system which is not due to trauma." Importantly, the pathology, and not the duration of the symptoms, is considered paramount.

Ischemic strokes may be further classified into etiologic subgroups, based on the mechanism of the ischemia and the type and localization of the vascular lesion. Cardioembolism as the source occurs in 15% to 30% of cases, large vessel atherosclerotic infarction varies from 14% to 40%, and small-vessel lacunar infarcts account for 15% to 30%. Stroke from other determined causes, such as arteritis or dissection, account for less than 5% of cases. In 30% to 40% of ischemic infarcts the cause cannot be determined. Intracranial hemorrhage may also be subdivided into subtypes, based on the site and vascular origin of the blood: subarachnoid, when the bleeding originates in the subarachnoid spaces surrounding the brain; and intracerebral, when the hemorrhage is into the brain parenchyma. Other forms of intracranial bleeding, such as subdural hemorrhage and epidural hemorrhage, are generally associated with trauma and not usually manifestations of stroke.

A further complicating issue is that advanced imaging techniques permit the detection of abnormalities consistent with infarction or microhemorrhage that are unassociated with any clinical symptoms. Therefore, current definitions distinguish between "stroke," which involves clinical symptoms, and "cerebral infarction," which need not be associated with symptoms of cerebral injury. However, these so-called "silent infarcts" are not so silent; they are associated with cognitive decline, dementia, gait disorders, functional disability, and an increased risk of clinical strokes. Because these subclinical infarcts are approximately five times more common than clinically evident strokes, including them (and microbleeds) within the rubric of *cerebrovascular disease* substantially increases the recognized burden of cerebrovascular disease.

In the United States, there are 6.4 million stroke survivors (prevalence of 3%), and there are approximately 600,000 new (incident) and 200,000 recurrent strokes per year. Of these

TABLE 116-1 COMMON FORMS OF CEREBROVASCULAR DISEASE

Ischemic cerebrovascular disease
Symptomatic
• Ischemic stroke
◦ Cerebral infarction
◦ Spinal cord infarction
◦ Retinal infarction
• Transient ischemic attack
• Transient monocular blindness (*amaurosis fugax*)
Asymptomatic
• Cerebral infarction/spinal cord infarction/retinal infarction
Hemorrhagic cerebrovascular disease
• Intracerebral hemorrhage
• Subarachnoid hemorrhage
• Intraventricular hemorrhage
• Subdural hemorrhage
• Epidural hemorrhage
• Cerebral microbleeds
Other forms of cerebrovascular disease
• Cerebral vein thrombosis
• Dural sinus thrombosis
Disorders of cerebral autoregulation
• Posterior reversible encephalopathy syndrome
• Hypertensive encephalopathy
• Reversible cerebral vasoconstriction syndrome
Vascular abnormalities
• Aneurysms
• Arteriovenous malformations
• Cavernous malformations
• Fibromuscular dysplasia