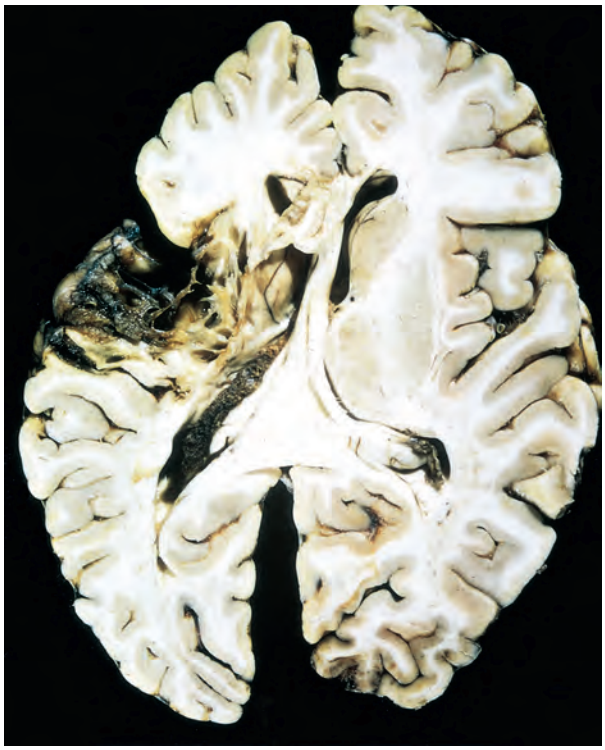

Figure 28-16 Old cystic infarct showing destruction of cortex with cavitation.

Microscopically, the tissue reaction evolves along the following sequence:

- *After the first 12 hours,* ischemic neuronal change (red neurons; see earlier) and both cytotoxic and vasogenic edema predominate. There is loss of the usual tinctorial characteristics of white- and gray matter structures. Endothelial and glial cells, mainly astrocytes, swell, and myelinated fibers begin to disintegrate.
- *Up to 48 hours,* neutrophilic emigration progressively increases and then falls off. Phagocytic cells, derived from circulating monocytes and activated microglia, are evident at *48 hours* and become the predominant cell type in the ensuing *2 to 3 weeks*. The macrophages become stuffed with the products of myelin breakdown or blood and may persist in the lesion for months to years.
- Reactive astrocytes can be seen as early as *1 week* after the insult. As the process of liquefaction and phagocytosis proceeds, astrocytes at the edges of the lesion progressively enlarge, divide, and develop a prominent network of cytoplasmic extensions.
- *After several months,* the astrocytic response recedes, leaving behind a dense meshwork of glial fibers admixed with new capillaries and some perivascular connective tissue. In the cerebral cortex, the cavity is separated from the meninges and subarachnoid space by a gliotic layer of tissue, derived from the molecular layer of the cortex. The pia and arachnoid are not affected and do not contribute to the healing process. Infarcts undergo these reactive and reparative stages from the edges inward; thus, different areas of a lesion may look different, particularly during the early stages, revealing the natural progression of the response.

The features and temporal evolution of **hemorrhagic infarctions** parallel ischemic infarctions, with the addition of blood extravasation and resorption. In individuals receiving anticoagulant treatment, hemorrhagic infarcts may be associated with extensive intracerebral hematomas. Venous infarcts are often hemorrhagic and may occur after thrombotic occlusion of the superior sagittal sinus or other sinuses or occlusion of the deep cerebral veins. Carcinoma, localized infections, and other conditions leading to a hypercoagulable state increase the risk for venous thrombosis.

Spinal cord infarction may be seen in the setting of hypoperfusion or as a consequence of traumatic interruption of the feeding tributaries derived from the aorta. Rarely, the cause is occlusion of the anterior spinal artery as a result of an embolus or vasculitis.

Clinical Features. Deficits produced by infarction are determined by the anatomic distribution of the damage, rather than the underlying cause. Neurologic symptoms referable to the area of injury often develop rapidly, over minutes, and may continue to evolve over hours. There can be improvement in severity of symptoms associated with reversal of injury in the ischemic penumbra as well as with resolution of associated local edema. In general, there is often a degree of slow improvement during a period of months. Because strokes are frequently associated with cardiovascular disease, many of the genetic and lifestyle risk factors are shared.

Hypertensive Cerebrovascular Disease

The most important effects of hypertension on the brain include lacunar infarcts, slit hemorrhages, and hypertensive encephalopathy, as well as massive hypertensive intracerebral hemorrhage. Aggressive management of hypertension is the primary approach to preventing this form of cerebrovascular disease.

Lacunar Infarcts

Hypertension affects the deep penetrating arteries and arterioles that supply the basal ganglia and hemispheric white matter as well as the brainstem. These cerebral vessels develop *arteriolar sclerosis* and may become occluded; the structural changes are similar to those described in the systemic vessels of individuals with hypertension (Chapter 11). An important clinical and pathologic consequence of CNS arterial lesions is the development of single or multiple, small, cavitary infarcts known as *lacunes* (Fig. 28-17). These are lakelike spaces, arbitrarily defined as less than 15 mm wide, which occur in the lenticular nucleus, thalamus, internal capsule, deep white matter, caudate nucleus, and pons, in descending order of frequency. On microscopic examination they show tissue loss surrounded by gliosis. Depending on their location in the CNS, lacunae can be clinically silent or cause severe neurologic impairment. Affected vessels may also be associated with widening of the perivascular spaces without tissue infarction *(état criblé)*.

Slit Hemorrhages

Hypertension also gives rise to rupture of the small-caliber penetrating vessels and the development of small