

VASCULAR DEMENTIA

Vascular dementia (VaD) is defined as permanent cognitive impairment produced by vascular damage to the brain. Although old textbooks, i.e., prior to 1980, suggested that most dementia is produced by strokes, recent autopsy brain studies show that vascular dementia is a far less common, i.e., third or fourth cause of intellectual loss in people over the age of 65.

The diagnostic criteria for vascular dementia include: 1) documented intellectual loss, 2) extensive vascular damage to the brain, and 3) a relationship in time between the occurrence of strokes and the appearance of intellectual symptoms. The timing of the strokes should coincide with the onset or progression of cognitive decline. Strokes are frequently seen in the brains of patients with other types of dementia, such as Alzheimer's disease. Mixed dementia is intellectual loss produced by multiple disease processes in the same brain, e.g., Alzheimer's and vascular dementia or Alzheimer's and diffuse Lewy body disease. Mixed dementia is quite common; especially with vascular damage as one component.

The symptoms of vascular dementia cannot be definitively distinguished from Alzheimer's symptoms based on history or mental status examination. Vascular dementia patients may have a stair-step clinical course in which they demonstrate significant drops of function following vascular injury to the brain (**Table 1**). Patients with vascular dementia develop cognitive, e.g., amnesia, aphasia, agnosia, and apraxia, as well as psychiatric symptoms, e.g., hallucinations, delusions, and behavioral disturbances that are common to most other types of dementia. The VaD patient may experience more behavioral problems and depression than Alzheimer patients.

Table 1. Symptoms of VaD

- Abrupt Onset
- Fluctuating Course
- History of Strokes
- Focal Neurological Symptoms

Dementia Other Than Alzheimer's

The clinical findings in persons with vascular dementia may be distinct from Alzheimer's disease. A significant number of VaD patients demonstrate focal neurological deficits that are not typically present in the Alzheimer's patient.

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Frequently, these neurological findings are subtle, e.g., mild weakness on one side of the body, abnormal reflexes, etc. The VaD patient often demonstrates other evidence of cardiovascular disease, e.g., hypertension, past history of heart attacks, peripheral vascular disease, etc. Brain imaging studies, e.g., CT or MRI scans, may be helpful for documenting specific strokes or other types of vascular damage to the brain. Functional studies such as SPECT scans, i.e., Single Photon Emission Computed Tomography, may demonstrate a pattern of patchy abnormal brain function, i.e., hypoperfusion, that is distinct from Alzheimer’s disease. There is no blood test or genetic screen for vascular dementia. Neuropsychological testing may help distinguish VaD from other types of dementia.

Vascular dementia is produced by cumulative vascular damage to the brain. No specific type, location, or size of stroke will predict intellectual decline. Observable vascular brain damage occurs in almost half of persons over the age of 65 and multiple different types of injury are present in many older persons **(Table 2)**. The five major types of vascular brain damage include: 1) strokes produced by atherosclerosis, 2) hypertensive changes, 3) anoxic brain damage, 4) ischemic white matter damage, and 5) hypotensive brain damage **(Table 3)**.

Table 2

ISCHEMIC BRAIN LESIONS IN OLDER PERSONS			
Pathology	n	Method	%
Any Infarct	5888 ¹	MR	36%
Lacunes	1086 ²	Autopsy	49%
Lacunes	1273 ³	CT	26%

1. Longitudinal Community Study; Radiology 1997, 202:47-54
2. Japanese Neuropsychiatric Autopsy Series; Stroke 1991, 22:993-996
3. Patients with past CVA’s; Stroke 1991, 22:175-181

Dementia Other Than Alzheimer's

Table 3

Type and Location of Vascular Pathology Commonly Seen in Vascular Dementia	
<u>TYPE</u>	<u>LOCATION</u>
Embolic Infarcts	Cortex
Lacunar Infarcts	Basal Ganglia and thalamus
White Matter Ischemia	Periventricular
Anoxic Brain Damage	Hippocampus
Hypotensive	Watershed zones, hippocampus

Dementia Other Than Alzheimer's

A stroke is the death of a discrete segment of brain tissue produced by cessation of blood flow to that region. Most strokes are produced by atherosclerosis; a disorder of larger diameter blood vessels. Atherosclerosis, i.e., hardening of the arteries, is a common disorder that is present in most persons over the age of 65. Hypertension, elevated lipids, and diabetes, are risk factors for atherosclerosis. Atherosclerosis damages the inner layer of a typical three-layer blood vessel and cholesterol debris is often deposited in the inner layer of large vessels. This bulging defect, i.e., atherosclerotic plaque, can produce a blood clot that occludes the blood vessel or fragments of debris from these deposits will break loose, travel down stream and produce a stroke by occluding a smaller diameter blood vessel. Most vascular dementia is produced by damage resulting from atherosclerosis **(Table 4)**.

Severe heart disease can produce poor blood flow and blood clot formation, i.e., thrombus, within heart chambers, i.e., ventricles. Emboli, i.e., fragments of these clots, can circulate to the brain and produce a variety of strokes. Irregular beating, i.e., arrhythmias, such as atrial fibrillation will often produce embolic strokes.

Table 4

CAUSES: Vascular Dementia				
TYPE	BIOLOGY	LOCATION OF SOURCE	LOCATION OF INFARCT	SEQUELAE
Atherosclerosis	<ul style="list-style-type: none"> • Hypertension • Elevated lipids 	Intima of large diameter blood vessels	Cortex	<ul style="list-style-type: none"> • Occlusion of vessel • Embolization • Low flow state
Arteriolarsclerosis	Hypertension	Media of small arteries	Subcortical	<ul style="list-style-type: none"> • Occlusion • Micro-aneurysm with hemorrhage
Embolization	Atherosclerosis	Heart or extracranial blood vessel	Cortical	<ul style="list-style-type: none"> • Embolic occlusion of vessel
White Matter Ischemia	Hypertension	Small vessels	Periventricular	<ul style="list-style-type: none"> • Unclear
Hypoperfusion	Low Blood Pressure	Cardiovascular Dysfunction	Watershed Zone	<ul style="list-style-type: none"> • Pale or red infarcts

Arteriolosclerosis is damage to small blood vessels produced by years of hypertension. Unlike atherosclerosis, hypertension will damage the middle layer of small caliber blood vessels. Hypertensive injury can progress to disintegration of the blood vessel wall and bleeding into brain tissue. Arteriolosclerosis can also result in blood vessel blockage that produces a small slit-like stroke referred to as a lacunar infarct. Hemorrhages or lacunes are common in persons with untreated hypertension and hemorrhage can lead to catastrophic damage or death.

The brain white matter contains fibers that connect neurons in each hemisphere or carry information to the spinal cord. The brain white matter is perfused by small penetrating blood vessels that travel long distances. These fragile blood vessels are susceptible to damage from high blood pressure and produce the “white matter abnormalities” that are commonly described in the brains of older patients. Multiple terms, e.g., Binswanger’s disease, subcortical arteriolar sclerotic leukoencephalopathy, and leukoariosis, are used to describe the white matter pathology. The relationship between white matter damage and dementia is unclear, although these patients are at higher risks for developing depression.

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Low oxygen or low blood flow to the brain produces anoxic brain damage. Neurons can only survive for three minutes without adequate oxygen or blood flow, e.g., persons who sustain a cardiac or respiratory arrest. Certain cardiac arrhythmias, i.e., irregularity of heart beat rhythm are associated with intellectual deficits. Atrial fibrillation is a common arrhythmia in the elderly that predisposes to strokes and intellectual decline. Vulnerable brain regions like the hippocampus are very sensitive to low oxygen and damage to this region produces amnesia. Many older patients who undergo cardiac bypass surgery will experience temporary or permanent intellectual deficits.

The treatment for vascular dementia is prevention. Most vascular damage to the brain can be avoided through control of blood pressure, lipids, heart disease, obesity, diabetes, smoking cessation, and regulation of heart rhythm. The medications presently available for Alzheimer's disease are not effective for patients with vascular dementia. The standard behavioral management strategies used for Alzheimer patients are appropriate for patients with vascular dementia. The treatment of psychiatric symptoms with psychotropic medication is similar to other dementias. The family caregiver of a vascular dementia patient requires the same support as any other dementia patient caregiver.

The natural history of vascular dementia may be more aggressive than Alzheimer's disease with two-thirds or three-quarters of VaD patients dead or institutionalized at five years. The VaD patients may demonstrate more psychiatric disability, e.g., depression. Control of cardiovascular disease, hypertension, or surgical repair of damaged blood vessels may improve patient outcomes (**Table 5**).

Table 5

Natural History at 5 Years for Vascular Dementia	
• 6.4%	Improved
• 43%	Died
• 21%	Remained Independent
• 29%	Required Long-term Care

ACTA. Neuro. Scan., 1996, Vol.165, pp.41-50
Dementia Other Than Alzheimer's

Vascular dementia can be distinguished from other dementias through careful attention to clinical history and neurological examination. The clinical presentation of VaD may differ from AD because VaD patients may have stair-step progression, focal neurological deficits, and vascular damage on brain imaging (**Table 6**). The Lewy body patient frequently presents with early hallucinations while the VaD patient usually demonstrates intellectual decline. The Lewy body patient has extrapyramidal symptoms while the vascular patient has focal neurological deficits. Alzheimer’s and frontal dementias rarely manifest focal neurological signs or evidence of extensive strokes on brain imaging.

In conclusion, multiple different types of vascular damage to the brain produce vascular dementia. The clinical history of VaD can resemble Alzheimer’s disease; however, the vascular dementia patient is more likely to have focal neurological deficits. Brain imaging may help to distinguish these two diseases. The treatment for vascular dementia is prevention and the natural history may be more aggressive than Alzheimer’s disease (**Table 6**).

Table 6

Common, Important, Early Manifestation of Dementia Patients Identified by a Basic Evaluation					
TYPE	EARLY COGNITIVE LOSS	EARLY PSYCHIATRIC SYMPTOMS	MEDICAL	NEUROLOGICAL	LABORATORY
Alzheimer’s	Moderate Amnesia	Mild anxiety, depression	None	None	None
Vascular	Moderate	Moderate • Depression • Psychosis	Hypertension Cardiovascular Disease	Focal Deficits	Strokes on CT
Alcoholic	Mild	Moderate Apathy	Heart, liver, pancreas, nerve	Ataxis, Sensory Loss	Abnormal: liver, blood, indices
Diffuse Lewy Body	• Moderate • Fluctuating	• Moderate visual hallucinations • Fluctuating	None	Parkinsonism	None
Frontotemporal Dementia	Mild	Moderate Apathy	None	None	None

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Any kind of dementia can produce any combination of symptoms. Some patients have mixed dementia.