

## VASCULAR DEMENTIA (VaD)

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### **Cerebrovascular Disease**

One of the most common attributes of aging is a progressive change in our blood vessels (vasculature), and when these changes occur in the brain (cerebrum) they are referred to as cerebrovascular disease.

The most common vascular change associated with age is the accumulation of cholesterol and other substances in the blood vessel walls. This results in the thickening and hardening of the walls as well as narrowing of the lumen of the vessels (the space where blood flows), which can result in a reduction or even a complete cessation of blood flow to brain regions supplied by the affected artery. When this occurs suddenly the result is a stroke, with symptoms ranging from weakness, to incoordination, to abnormal sensations, depending on the location of the injury in the brain. In some cases, a sudden loss of cognitive function (such as language, memory, complex visual processing, or organizational skills) can occur.

These sudden changes in neurologic function usually prompt a quick medical evaluation, and strokes are usually diagnosed easily with modern brain imaging techniques. If they result in a permanent cognitive impairment, this is easily recognized by the patient, their family and their physician, because of the obvious relationship of the change to a particular event. The cognitive problems are usually worst at their onset, and improve over time. Such cases are not usually diagnosed as dementia, but rather the difficulties are appropriately described as residual cognitive impairment from the stroke.

### **What is “Vascular Dementia”?**

The term Vascular Dementia (VaD) is usually reserved for an insidiously (subtly) progressive worsening of memory and other cognitive functions. In this way and others, VaD patients present with similar symptoms to Alzheimer’s disease (AD) patients. However, the related changes in the brain are not due to AD pathology but due to chronic, reduced blood flow in the brain, eventually resulting in dementia. Clinically, such patients may look very similar to patients with AD, and the two diseases are very difficult to distinguish from each other. However some clinical symptoms and brain imaging findings suggest that vascular disease is playing a role in, if not completely explaining, a patient’s cognitive impairment

As is the case with AD, the cognitive changes in VaD can remain quite mild for a substantial period of time, or may worsen over time. Patients with more advanced VaD experience severe disruption in their personal, social, and vocational functioning. Early recognition of VaD is important because many of the risk factors leading to

cerebrovascular disease can be managed medically. Proper management of some of these risk factors has been shown to reduce the risk of developing cognitive impairment.

### **Demographics**

VaD is considered one of the most common types of dementia in older adults. However, because it is difficult to diagnose definitively, many studies examining its prevalence may be incorrect. In the U.S. and Western Europe, the ratio of VaD to AD is generally thought to be 1:5, and dementia following stroke is thought to occur in one quarter to one third of cases of stroke. The incidence of dementia rises exponentially for patients with cerebrovascular risk factors such as hypertension, cardiac disease, diabetes, smoking, alcoholism, and hyperlipidemia.

Demographic factors such as male gender and African American ethnicity are also known risk factors. Age of onset is variable, though older adults are most at risk, secondary to increased cerebrovascular disease later in life.

### **Symptoms**

The major presenting complaint in patients with VaD is probably memory. Although the complaint on the surface is similar to AD, memory difficulties in VaD may be more easily overcome with cues and reminders. Other symptoms frequently include difficulty with organization and solving complex problems, slowed thinking, distraction or “absent mindedness”, and difficulty retrieving words from memory.

Additionally, there may be changes in mood or behavior such as depression, irritability, or apathy. In some instances VaD patients may experience hallucinations or delusions that can be quite distressing to patients and caregivers.

VaD may progress in a “stepwise” fashion such that initial cognitive deficits (e.g., memory difficulty) plateau for a period of time followed by the sudden onset of more cognitive deficits. However, more commonly, initial cognitive deficits present subtly and progress slowly over time.

Difficulties with balance and movement may be seen in VaD. Some of the features of Parkinson’s disease may occur, such as tremor. Studies have shown that problems with walking and balance in the setting of dementia increase the likelihood of a vascular contribution. This can be one of the most useful clinical features, because problems with movement are not usually seen in AD until late in the course of the disease. Other diseases causing dementia, such as Progressive Supranuclear Palsy (PSP) and Corticobasal degeneration (CBD), are also associated with movement problems.

## Evaluation

The goals of the evaluation for a patient who may have VaD are to assess whether there is evidence for dementia (cognitive impairment severe enough to cause a significant deterioration in function) and then to investigate the cause in order to structure treatment.

The evaluation should involve a thorough history to document the degree and types of cognitive difficulty and to evaluate for the presence of vascular risk factors. A neurologic exam should also be conducted, with a particular focus on looking for signs of prior strokes (because a single stroke only affects a portion of the brain, these signs are called “focal” neurologic signs). Blood pressure should also be assessed. At least a brief neuropsychological evaluation of memory and other cognitive functions is warranted. Because depression and emotional behavior are often altered in this disease, questions regarding these symptoms are important. The patient should be accompanied by a family member or friend who can provide information as to the patient’s degree of memory loss and functional impairment with respect to daily activities.

Evaluation also includes a number of blood tests that are part of the routine evaluation of cognitive impairment, including tests of thyroid function and vitamin B12 levels, and other tests, as necessary. In the particular case of suspected VaD, tests looking for evidence of diabetes and cholesterol levels should be included.

One of the most useful tests in the evaluation of VaD is magnetic resonance imaging (MRI). The MRI is very sensitive to changes in the brain caused by stroke. The principal findings in VaD are lacunar infarcts (small, spherical strokes in the deep parts of the brain) and abnormal findings in the cerebral white matter. This is the region where axons (wires connecting one nerve to the next) travel. It is called the white matter because the fatty insulation on the axons makes it look white in real life.

The figure below shows the changes in the brain thought to occur as very small strokes accumulate. This scan is compared with an MRI scan without these changes. These changes can be seen in many people who appear to have no cognitive complaints. However, studies have shown that as the total volume of these changes increases, cognitive difficulties are more likely.

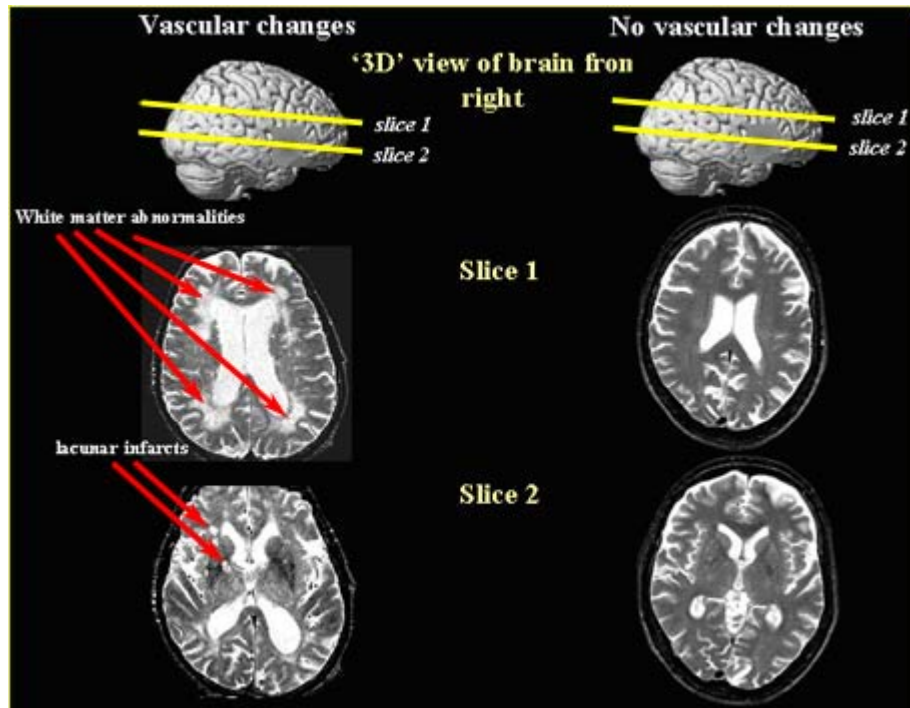


Figure 1. MRI from patients with (left) and without (right) abnormalities of the type seen in VaD. Images on the bottom are single MRI 'slices' through the brain. The top images are three dimensional views of the brain, with the yellow lines denoting the location of the slices below.

## Diagnosis

The most difficult issue in the diagnosis of VaD is its differentiation from AD. As discussed above, the cognitive and behavioral symptoms of AD and VaD frequently look quite similar. More importantly, the presence of complaints, neuropsychological abnormalities, exam findings or even imaging findings suggesting VaD cannot eliminate the possibility of AD. Autopsy studies have shown that many patients have both AD and VaD. Differentiating AD from VaD and the co-occurrence of these disorders is a subject of active investigation.

## Comparison with Other Disorders

### Alzheimer's Disease (AD)

AD is caused by progressive degeneration of nerve cells due to abnormalities in brain function that are not completely understood. As discussed above, many of the symptoms in AD are similar to those seen in VaD, in part because they may both be present in the same individual.

### Mild Cognitive Impairment (MCI)

MCI is defined by deficits in memory with intact daily functioning. Memory deficits are usually well managed by compensatory mechanisms such as writing reminders and

using a daily calendar. The memory deficits in MCI may remain stable for years or may progress to dementia. If MCI progresses to dementia, the cause is often AD. However, some individuals with MCI develop cognitive deficits and functional impairment consistent with VaD. How often the MCI syndrome is due to vascular injury causing VaD is still unknown.

### **Frontotemporal Dementia (FTD)**

Like AD, FTD is caused by progressive degeneration of nerve cells due to abnormalities in brain function, but the specific biochemical abnormalities appear to be different. FTD is characterized by early and prominent changes in behavior or language with little or no memory deficits. In FTD, an individual becomes disinhibited, and socially inappropriate, whereas people with VaD generally remain socially appropriate.

Language deficits that accompany FTD, such as difficulty with reading, writing, naming, comprehending, using correct words and expressing thoughts fluently may also appear in VaD, if a particularly large stroke affects the left hemisphere. In general, the profound language deficits seen in FTD are not seen in VaD. A careful and comprehensive evaluation of these language deficits may assist with differentiating VaD from FTD. VaD patients usually have more difficulty with memory and spatial skills than FTD patients.

### **Treatment**

Currently, there is no treatment that can repair the effects of Vascular Dementia. Treatment approaches are aimed at preventing future vascular insults by controlling major risk factors.

High blood pressure and elevated cholesterol can be effectively treated with a combination of medicine, regular exercise and a healthy diet. There is substantial evidence that treatment of these conditions reduces the risk of developing dementia. Risk of further vascular incidents is decreased when diabetes is well controlled. Reducing or eliminating smoking and/or reducing alcohol intake may also be effective prevention of VaD.

Studies are ongoing to investigate whether medications for AD, such as cholinesterase inhibitors, are effective in VaD.

### **Caregivers**

Caring for a loved one affected by Vascular Disease can be challenging for a spouse, family member, friend, or other caregiver. Caregivers may experience worry, guilt, isolation or a number of other unpleasant feelings and should seek support in dealing with such difficulties.