

Association between Long-Standing Uncontrolled Hypertension and Alzheimer's disease

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Abstract: Hypertension is a common health problem worldwide. The prevalence of hypertension is increasing. Due to the availability of a large variety of options to treat hypertension, there is good symptomatic control and prevention of complications is possible. On the other hand, Alzheimer's disease is a potentially fatal condition which is usually prevalent in the elderly population. There is no cure for Alzheimer's disease and treatment options for symptomatic control are very limited leading to an increasing need to work on prevention of risk factors predisposing to this fatal condition. Prolonged and uncontrolled hypertension leads to cerebrovascular insult, accumulation of plaques and tangles and predisposing the person to Alzheimer's disease in long run. Since hypertension can be treated and complications can be prevented by strict control on blood pressure levels, hence it is important to understand the association of hypertension and Alzheimer's disease and the fact that strict control on hypertension can prevent cerebrovascular insult and hence Alzheimer's disease.

Keywords: Hypertension, Alzheimer's disease, treatment.

1. INTRODUCTION

Hypertension is a medical condition in which the blood pressure in the arteries is persistently elevated. Hypertension can be primary or secondary (due to some underlying cause). Long-term high blood pressure, however, is a major risk factor for coronary artery disease, stroke, heart failure, atrial fibrillation, peripheral vascular disease, vision loss, chronic kidney disease, and dementia (including Alzheimer's disease).

Increasing evidence also suggests that hypertension is a risk factor for Alzheimer's disease (AD), highlighting its participation in all major causes of cognitive impairment.

High Blood Pressure in the United States:

Having high blood pressure puts a person at risk for heart disease and stroke, which are leading causes of death in the United States. About 75 million American adults (32%) have a high blood pressure—that's 1 in every 3 adults. About 1 in 3 American adults have pre-hypertension—blood pressure numbers that are higher than normal—but not yet in the high blood pressure range. Only about half (54%) of people with high blood pressure have their condition under control. High blood pressure was a primary or contributing cause of death for more than 410,000 Americans in 2014—that's more than 1,100 deaths each day. High blood pressure costs the nation \$48.6 billion each year. This total includes the cost of health care services, medications to treat high blood pressure, and missed days of work.

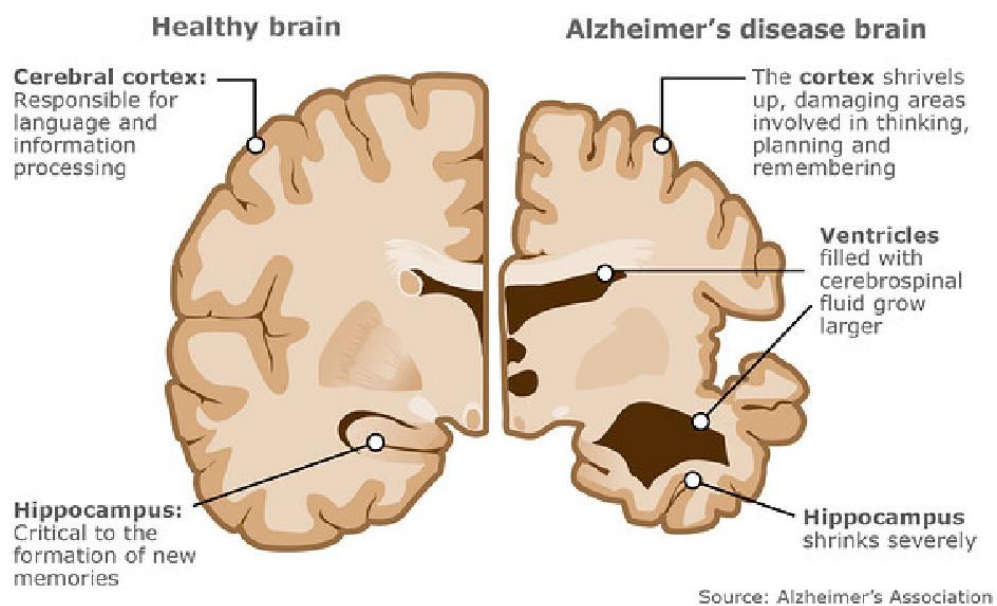
There are several types of drugs used to treat high blood pressure, including:

- Angiotensin-converting enzyme (ACE) inhibitors.
- Angiotensin II receptor blockers (ARBs)
- Diuretics.
- Beta-blockers.
- Calcium channel blockers.
- Alpha-blockers.
- Alpha-agonists.
- Renin inhibitors.

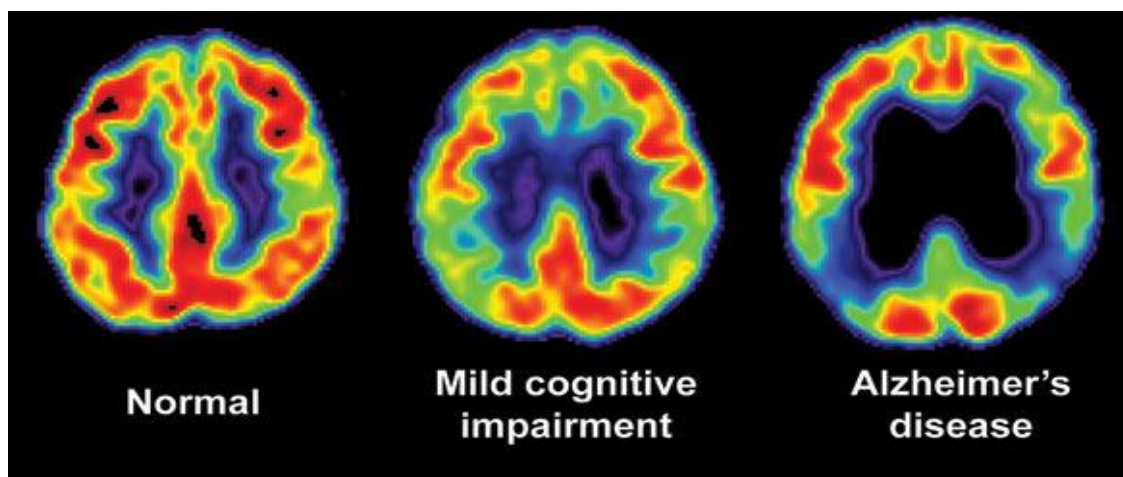
Alzheimer's disease (AD), also referred to simply as Alzheimer's, is a chronic neurodegenerative disease that usually starts slowly and worsens over time. Alzheimer's is the most common form of dementia, a general term for memory loss and other cognitive abilities serious enough to interfere with daily life. Alzheimer's disease accounts for 60 to 80 percent of dementia cases. Alzheimer's is not a normal part of aging. The greatest known risk factor is increasing age, and the majority of people with Alzheimer's are 65 and older. But Alzheimer's is not just a disease of old age. Approximately 200,000 Americans under the age of 65 have younger-onset Alzheimer's disease (also known as early-onset Alzheimer's). The cause of Alzheimer's disease is poorly understood. About 70% of the risk is believed to be genetic with many genes usually involved. Other risk factors include a history of head injuries, depression, or hypertension. The disease process is associated with senile neuritic plaques and neurofibrillary tangles in the brain. A probable diagnosis is based on the history of the illness and cognitive testing with medical imaging and blood tests to rule out other possible causes. Initial symptoms are often mistaken for normal aging. Examination of brain tissue is needed for a definite diagnosis. Mental and physical exercise, and avoiding obesity may decrease the risk of Alzheimer's Disease; however, evidence to support these recommendations is not strong. There are no medications or supplements that decrease risk. No treatments stop or reverse its progression, though some may temporarily improve symptoms.

Two types of drugs are currently used to treat cognitive symptoms:

- Cholinesterase inhibitors. These drugs work by boosting levels of a cell-to-cell communication by providing a neurotransmitter (acetylcholine) that is depleted in the brain by Alzheimer's disease.
- Memantine (Namenda)



CHANGES IN THE CEREBRAL BLOOD FLOW IN ALZHEIMER'S DISEASE:



Hypertension is not cured but medications can provide symptomatic control. A large variety of drugs are available for the treatment of hypertension. In contrast, there are not enough options for a patient with Alzheimer's disease and the outcome is fatal. So, the best approach is to prevent and treat the risk factors for the Alzheimer's disease i.e., Hypertension. It is hypothesized that antihypertensive medications, especially diuretics, angiotensin-1 receptor blockers (ARB), and calcium channel blockers (CCB), would decrease the risk of Alzheimer's disease dementia in people with mild or no cognitive impairment.

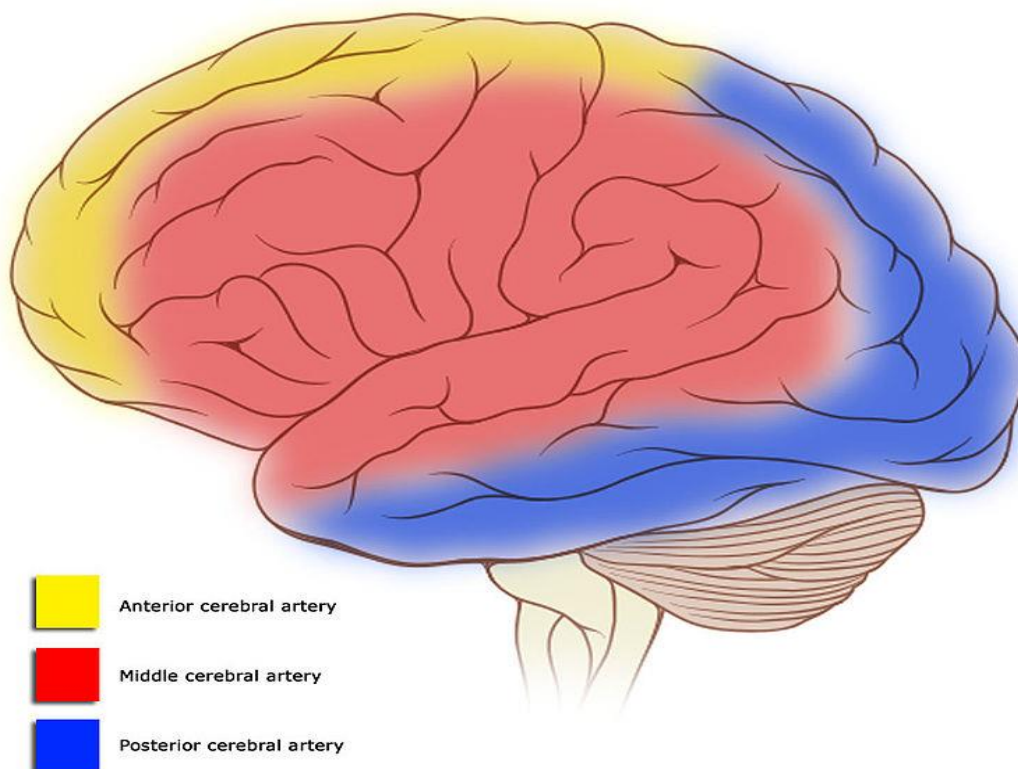
2. METHODOLOGY

This is a review article and data is pooled from the literature to come to an understanding of a possible association between Hypertension and Alzheimer's disease. To understand the pathophysiology and association of Alzheimer's disease with prolonged uncontrolled hypertension, data is collected from the past researches based on effects of hypertension on neurocognitive functions and Alzheimer's disease. The data is collected from articles published from past 30 years. The hypothesis of following association is based on interpretation of already conducted researches and studies on individual diseases. To support the association of hypertension and Alzheimer's disease a review summary of the pooled data is made showing the association.

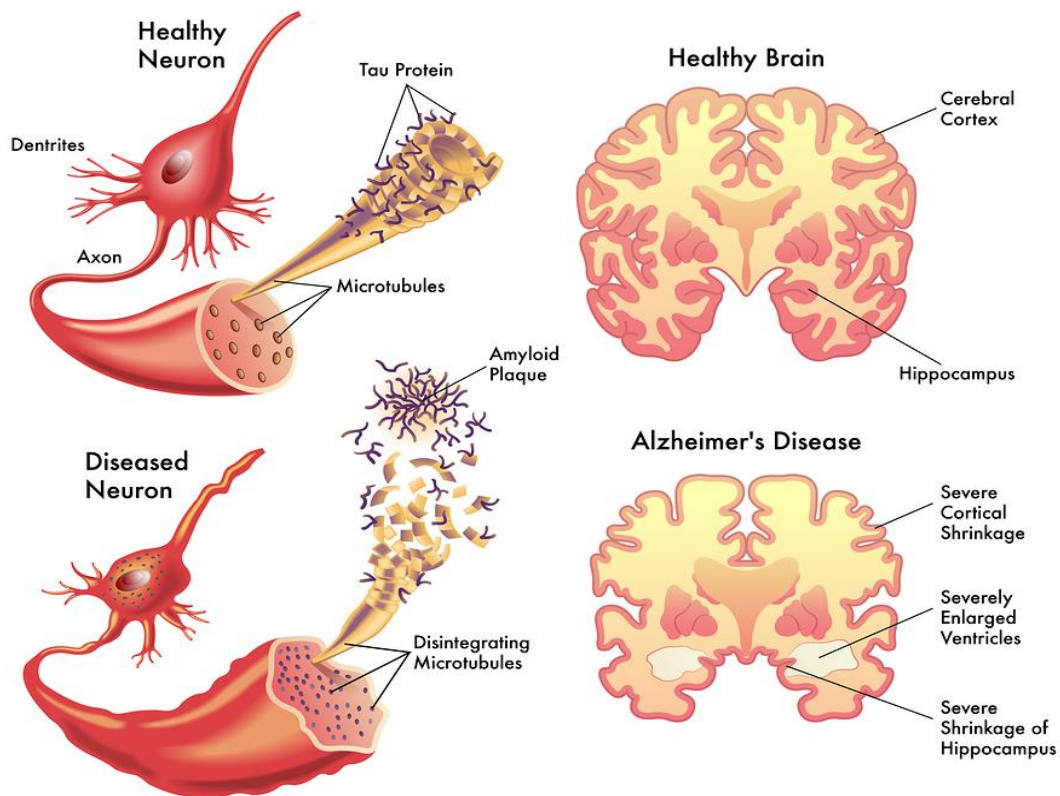
3. RESULTS

In particular, some studies, but not all, have shown that mid life hypertension is a risk factor for the Alzheimer's Disease. Although the mechanisms of the association remain unclear, there is evidence that hypertension may promote the accumulation and/or aggregation of the A β peptide in the brain. Increases in brain amyloid have been reported in ApoE4+ hypertensive individuals, an effect reduced by antihypertensive treatment. The findings raise the possibility that the cerebrovascular dysfunction and damage produced by midlife hypertension impairs the vascular clearance of brain A β , resulting in amyloid accumulation in cerebral blood vessels and cognitive dysfunction. Drugs acting on peripheral blood vessels like Nitrates, calcium channel blockers, ACE inhibitors, Diuretics and Hydralazine might be beneficial as they act on peripheral vessels and decrease cerebrovascular insults.

Cortical vascular territories



Amyloid Plaques in Alzheimer's Disease:



4. CONCLUSION

Based on the review of past research studies it is evident that hypertension is a significant risk factor for the later development Alzheimer's disease. Whatever the mechanisms of the interaction between hypertension and Alzheimer's disease, the realization that cerebrovascular damage may play a role in Alzheimer's disease supports the notion that maintaining vascular health by preventing vascular insult and controlling vascular risk factors, such as hypertension, may be an important preventive strategy for late-life dementia and Alzheimer's disease. Since there is no cure for Alzheimer's disease and only the progression can be delayed, so the risk factors like hypertension should be treated and long-term effects of uncontrolled hypertension should be avoided.

Disclosure- none

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