

Review Article

A Review Article of Hypertension and Cognitive Decline

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Abstract

Objectives: This article will discuss three questions. 1. Is there a link between hypertension and cognitive impairment? 2. Can treatment of hypertension prevent or slow down cognitive decline? 3. Which group of hypertensive patients are at higher risk for developing dementia? The relation between hypertension and cognitive function has been the subject of discussion and research for many years; recently, there has been a trend toward lower blood pressure goals and earlier intervention, this was implemented in the Eighth Joint National Committee (JNC 8) guidelines and adopted by the American Heart Association in 2017 as well as the European Society of Cardiology in 2018, these changes reflect the results of major clinical trials. Although the available data are promising in regard to better cardiovascular and mortality outcomes with lower blood pressure targets, their effect on cognitive decline is still uncertain. In this article, we review recent published literature studying the link between hypertension and cognitive impairment. We review the current understanding of the pathophysiology and identify the challenges facing the scientific community in ongoing and future studies. Identifying high-risk individuals as potential targets for aggressive monitoring and treatment is explored. We also review some of the suggested pharmacological and non-pharmacological intervention strategies to tackle this global epidemic.

Key words: Cognitive impairment, dementia, hypertension

Introduction

Hypertension is a condition with high prevalence that is estimated to affect around eighty million individuals in the United States and one billion persons worldwide.^[1] The prevalence of hypertension in India is 29.8%, and is estimated to be responsible for two thirds of stroke deaths and one fourth of coronary deaths.^[2] According to the Alzheimer's Association, cognitive dysfunction affected more than 35 million people in 2010, and is projected to double every ten years with about two-thirds of these subjects living in places with limited healthcare resources.^[3]

There is adequate evidence in the literature to support an association between high blood pressure and impairment in cognition that is beyond its relationship to frank stroke.^[4,5]

Hypertension is thought to be a risk factor for both Alzheimer's dementia and vascular dementia, it is also linked

to various degrees of cognitive dysfunction, a spectrum ranging from mild neurocognitive impairment to frank dementia (which is defined as major neurocognitive disorder).^[6]

Mechanism

High blood pressure has been linked to impairment of several aspects of cognitive functions such as decline in abstract thinking (executive dysfunction), delay in mental processing, and deficits in memory.^[7]

Among the suggested pathophysiological changes in the brain and its vascular supply are blood vessel remodeling, defects in autonomic regulation, microhemorrhages, lesions of the substantia alba, silent infarcts, amyloid angiopathy, and cerebral atrophy, while this might explain the correlation between hypertension and ischemic strokes or vascular

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Received: 12-03-2020; Accepted: 30-03-2020

doi: 10.15713/ins.john.0180



dementia, this also holds true for other types of dementia, for example, the link between long-term uncontrolled high blood pressure and Alzheimer's dementia has been documented, with hypertension being associated with forming neurofibrillary tangles and senile plaques, the presence of which was observed in brains of hypertensives even when they did not hold a clinical identification of dementia.^[8]

Discussion

While the data may suggest that optimal control of blood pressure may help prevent or at least delay the process of cognitive downturn, especially in those at risk of such impairment, in reality, this question has not been answered fully yet, due to unavailability of randomized clinical trials clearly showing a benefit of such intervention.

In their statement in 2016, the American Heart Association endorsed that chronic hypertension is a well-recognized risk factor for both Alzheimer and vascular dementias. The AHA also deduced that there was lack of enough data to establish evidence-supported recommendations, as information from randomized clinical trials that controlling high blood pressure at any stage of life improves cognition is still inconclusive.^[9]

Interestingly, there is well-documented evidence that hypertension earlier in life is associated with changes in cognitive functions that manifest both in mid and late life, but the relation between high BP in later stages of life and cognition is less clear, with evidence of both harmful and beneficial effects of treating high BP on cognition. In other words, the younger the hypertensive individual, the more likely they benefit from lifestyle and/or pharmacological intervention. This enhances the importance of early diagnosis and treatment and the role of preventative medicine in preserving cognitive functions.^[10]

Perhaps, the most up-to-date larger scale data come from the SPRINT-MIND trial published in the Journal of American Medical Association, JAMA in 2019 which aimed to investigate whether intensive blood pressure control reduces the occurrence of dementia. The study concluded that intensive blood pressure control (defined as systolic blood pressure of <120 mmHg as opposed to conventional goal of <140 mmHg) did not significantly reduce the risk of probable dementia, but there was statistically significant evidence that it reduces the risk of mild cognitive impairment (MCI). This marks the 1st time an intervention has shown a reduction in MCI in a large group of people. This marks the first time an intervention has shown a reduction in MCI (mild cognitive impairment) in a large group of people. The ongoing SPRINT MIND 2.0 trial seeks to determine whether this intervention can also reduce the risk of progression to dementia.^[11]

Another important study furthering our understanding of this complex subject comes from Spain, specifically analysis from the ISSYS cohort (Investigating Silent Strokes in Hypertensives: A Magnetic Resonance Imaging Study), published in Hypertension in January 2019. The study evaluated

incident lacunar infarcts, cerebral microbleeds, changes in the periventricular, and deep white matter hyperintensities (WMHs). The authors concluded that hypertensive patients with progression of periventricular WMH have higher odds of cognitive impairment, even in the early stages of cognitive decline.^[12]

In addition to investigating the correlation between hypertension and cognitive decline, other studies have focused on intervention strategies, including lifestyle modification and pharmacological treatments, with some data supporting that adherence to the DASH diet or dietary approach to stop hypertension for long term is crucial to preserve cognitive functions at later stages of life,^[13] while another study suggested addressing sleep apnea as an underlying factor for both hypertension and cognitive decline.^[14] It is also worth mentioning that some research entertained the idea that certain antihypertensive drugs such as diuretics may have neuroprotective characteristics beyond their role in lowering blood pressure.^[15]

Conclusion

Recent publications and ongoing studies demonstrate efforts to identify at risk populations that are most likely to benefit from intensive treatment. However, the effect of treatment on cognitive function in larger population-based studies has yet to be explored. Challenges in these studies include keeping a standard definition of hypertension, standard method of measurement, controlling for other contributors to cognitive impairment (e.g. diabetes, lipids, alcohol abuse, sleep apnea, diet, physical activity, and tobacco use), as well as having a standard definition and methods of assessing cognitive impairment.

Recommendations

The current studies suggest that younger hypertensive individuals may particularly benefit from lifestyle and/or pharmacological intervention. Until randomized clinical trials demonstrate that the treatment of hypertension results in less cognitive decline, it is recommended to use standard treatment measures for controlling hypertension and heart healthy lifestyles.

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How to cite this article: Jebaje ZA, Williams G. A Review Article of Hypertension and Cognitive Decline. *Hypertens* 2020;6(1): 30-32.

Source of support: Nil, **Conflicts of interest:** None

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