Published in final edited form as:

JAMA. 2015 May 19; 313(19): 1963–1964. doi:10.1001/jama.2015.3113.

Blood Pressure Control: something to think about as we age

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Keywords

Blood pressure; hypertension; pre-hypertension; cognition and dementia

Along with declining memory performance, elevation of systolic blood pressure and an increased prevalence of hypertension are expected consequences of advancing age. It is not surprising, therefore, to expect that the two processes may be related. In 1987, Hachinski et al first identified brain injury and subtle cognitive impairment associated with elevated levels of systolic blood pressure (SBP)¹. In 1995, Launer et al² found that elevations in middle-life blood pressure were associated with reduced cognitive function in later life. Many studies subsequently confirmed and extended research related to the relationships among middle-life blood pressure, brain injury and cognitive function among community living individuals, suggesting that the inverse relationship between middle-life blood pressure and reduced cognitive ability is nearly universal. Using a twin study design, Swan et al³, also confirmed the association between middle-life patterns of SBP and cognition and identified that the cognitive differences were likely mediated by brain injury related to the level of middle-life blood pressure.

This seemingly straightforward association between elevated SBP and reduced cognitive ability was challenged when a number of studies found that blood pressure appeared to decline years before the onset of dementia, that cross-sectional measures of blood pressure obtained later in life were not strongly associated with brain structure or cognition, and that treatment of elevated blood pressure in later life was not associated with reduced likelihood of incident dementia⁴. The literature is further limited by the fact that hypertension prevalence is greater among non-white populations, whereas much of the research on hypertension and cognition utilized data from Caucasian cohorts.

The Atherosclerosis Risk in Communities (ARIC) addresses many of these discrepancies in the literature. This project was designed to examine the association of vascular risk factors with general and cognitive health. The project was initiated in 1987, and recruited more than 15,000 individuals from four communities throughout the Eastern and Southern United States. When recruited, participants were between the ages of 45 and 64 with approximately 30% of the study cohort being African Americans.

In a recent study in *JAMA Neurology*, Gottesman et al⁵ address the controversies of blood pressure regulation and cognition with a report on longitudinal differences in cognitive performance over 20 years in relation to baseline blood pressure measures among the participants of the ARIC cohort. In addition, the authors explored the effects that various definitions of blood pressure, medical illnesses commonly associated with hypertension, drop-out and mortality also might have on the results.

Gottesman et al report a number of important observations. In this essentially healthy, community based cohort who were, on average, 56 years of age when baseline cognitive assessment was obtained, pre-hypertension or hypertension was present at baseline in 58% of whites and in 76 % in the African American study participants. Death was a major outcome related to having hypertension at the first evaluation, with fewer than 50% of individuals with SBP greater than 160 mm/Hg surviving to an average age of 76 years. Of those who survived and continued to participate in the study through the 5 visits over 20 years, there was a significant, albeit modest association between baseline SBP and rate of cognitive decline, particularly in tasks mediated by attention, short-term memory and retrieval. Moreover, when SBP was analyzed as a continuous measure, there was an inverse, linear relationship with rate of cognitive decline (i.e., the higher the middle-life SBP, the greater the rate of decline). When the effect of mortality was taken into account, however, the effect size of hypertension on global cognitive performance was increased by nearly 70% from -0.56 to -0.091. Initial analyses excluded individuals who became demented over the course of the study, but secondary analyses that included demented individuals strengthened the relationship between SBP and rate of cognitive decline. Moreover, individuals receiving hypertension treatment had substantially slower rates of cognitive decline compared to those who were untreated, particularly among African Americans. Consistent with other studies, there was no association between SBP level measured when patients were assessed at the 20 year follow up and cognitive ability.

The authors conclude that lowering blood pressure is associated with reduced risk of negative cognitive consequences of hypertension and note that the duration of existing clinical trials may be too short to identify a subtle benefit of anti-hypertensive therapy on cognitive outcomes. However, as the authors further note, even subtle improvements in blood pressure control could have a large population effect that might further translate into reduced life-time risk for late-life dementia.

This study highlights the importance of blood pressure control, but also emphasizes the need to begin treatment early in life. The proportion of people with hypertension receiving effective treatment is increasing.⁶ However, considerable numbers of people younger than 50 years old who have hypertension are not getting diagnosed or treated appropriately. There needs to be greater awareness of the negative health effects of hypertension to younger patients as data from the Framingham Heart Study shows that brain injury can occur before 50 years of age⁷ from pre-hypertension and hypertension in addition to the cognitive findings found previously in ARIC⁸. Treating hypertension in younger patients, therefore, will not only save lives, but also improve the quality of life and may reduce dementia complications that occur later in life.

Acknowledgments

Supported by NIH P30 AG10129, R01 AG08122, R01 AG012975, R01 AG021028, R01 AG047827

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