Original Investigation

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Association of Intensive vs Standard Blood Pressure Control With Cerebral Blood Flow

Secondary Analysis of the SPRINT MIND Randomized Clinical Trial

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Visual Abstract

Key Points

Question Is intensive antihypertensive treatment associated with increased risk of cerebral hypoperfusion compared with standard treatment?

Findings In a magnetic resonance imaging substudy within SPRINT of 547 patients, at 4-year follow-up, an intensive systolic blood pressure target of less than 120 mm Hg was associated with a significantly larger increase in cerebral blood flow compared with a standard blood pressure target of less than 140 mm Hg among adults with hypertension. This association was most pronounced among participants with a history of cardiovascular disease.

Meaning Compared with a standard blood pressure target, an intensive blood pressure target was associated with increased, rather than decreased, cerebral perfusion in this study.

Abstract

Importance Antihypertensive treatments benefit cerebrovascular health and cognitive function in patients with hypertension, but it is uncertain whether an intensive blood pressure target leads to potentially harmful cerebral hypoperfusion.

Objective To investigate the association of intensive systolic blood pressure (SBP) control vs standard control with whole-brain cerebral blood flow (CBF).

Design, Setting, and Participants This substudy of the Systolic Blood Pressure Intervention Trial (SPRINT) randomized clinical trial compared the efficacy of 2 different blood pressure–lowering strategies with longitudinal brain magnetic resonance imaging (MRI) including arterial spin labeled perfusion imaging to quantify CBF. A total of 1267 adults 50 years or older with hypertension and increased cardiovascular risk but free of diabetes or dementia were screened for the SPRINT substudy from 6 sites in the US. Randomization began in November 2010 with final follow-up MRI in July 2016. Analyses were performed from September 2020 through December 2021.

Interventions Study participants with baseline CBF measures were randomized to an intensive SBP target less than 120 mm Hg or standard SBP target less than 140 mm Hg.

Main Outcomes and Measures The primary outcome was change in whole-brain CBF from baseline. Secondary outcomes were change in gray matter, white matter, and periventricular white matter CBF.

Results Among 547 participants with CBF measured at baseline, the mean (SD) age was 67.5 (8.1) years and 219 (40.0%) were women; 315 completed follow-up MRI at a median (IQR) of 4.0 (3.7-4.1) years after randomization. Mean whole-brain CBF increased from 38.90 to 40.36 (difference, 1.46 [95% CI, 0.08-2.83]) mL/100 g/min in the intensive treatment group, with no mean increase in the standard treatment group (37.96 to 37.12; difference, −0.84 [95% CI, −2.30 to 0.61] mL/100 g/min; between-group difference, 2.30 [95% CI, 0.30-4.30; $P = .02$]). Gray, white, and periventricular white matter CBF showed similar changes. The association of intensive vs standard treatment with CBF was generally similar across subgroups defined by age, sex, race, chronic kidney disease, SBP, orthostatic hypotension, and frailty, with the exception of an indication of larger mean increases in CBF associated with intensive treatment among participants with a history of cardiovascular disease (interaction $P = .05$).

Conclusions and Relevance Intensive vs standard antihypertensive treatment was associated with increased, rather than decreased, cerebral perfusion, most notably in participants with a history of cardiovascular disease.

Trial Registration ClinicalTrials.gov Identifier: NCT01206062

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