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Original Study

Antihypertensive and Statin Medication Use and Motor Function in Community-Dwelling Older Adults



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A B S T R A C T

Keywords:

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Objectives: To investigate whether the use of antihypertensive and statin medication in very old adults is associated with the level of motor performance.

Design: Cross-sectional study.

Settings: A community-based study recruited from over 40 residential facilities across the metropolitan Chicago area.

Participants: Community-dwelling very old adults (n = 1520; mean age 80.2; standard deviation 7.7).

Measurements: Eleven motor performances were summarized using a composite motor score. All prescription and over the counter medications taken by participants were inspected and coded using the Medi-Span Data Base System. Demographic characteristics and medical history were obtained by means of detailed interview and medical examinations.

Results: In multiple linear regression models, antihypertensive medications were associated with global motor score [$\beta = -0.075$, standard error (SE) 0.011, $P < .001$]. Thus, motor function in an individual with antihypertensive medication, was on average, about 7.5% lower than an age-, sex-, and education-matched individual without antihypertensive medication. The number of antihypertensive medications, which were being used had an additive effect, such that a reduction in the level of motor function was observed with each additional medication, and receiving 3 or more antihypertensive medications was associated with about a 15% reduction in the level of motor function. The association between antihypertensive medications and motor function was robust, and remained unchanged after adjusting for confounding by indication using several potentially confounding variables: smoking, hypertension, diabetes, stroke, congestive heart failure, myocardial infarction, and intermittent claudication ($\beta = -0.05$, SE 0.015, $P = .001$). In contrast, the use of statin medications was not related to motor function (unadjusted: $\beta = 0.003$, SE 0.015, $P = .826$; fully adjusted: $\beta = 0.018$, SE 0.014, $P = .216$).

Conclusions: The use of antihypertensive medications is associated with a lower level of motor function in very old adults. The nature of this association warrants further investigation.

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Loss of motor function is common in older adults and associated with a wide range of adverse health outcomes, including increased

risk for disability, cognitive decline, and mortality.^{1–3} Identifying risk factors for late-life motor impairment is crucial for efforts to mitigate its growing personal and societal burden in our aging population. Several medications commonly used by elderly people can potentially influence the rate and extent of late-life motor impairment.

Cardiovascular and cerebrovascular diseases are common and increase with age, affecting as many as 80% of individuals over the age of 80.⁴ Cardiovascular risk factors are prevalent among older adults. Age-adjusted hypertension prevalence in the United States is estimated at 75% for older women, and 65% for older men,⁴ whereas dyslipidemia has been reported in 34% of persons over the age of 75.⁵ Based on clinical trials, over the last 3 decades, public health efforts have

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The authors declare no conflicts of interest.

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focused on treatment for hypertension and dyslipidemia to reduce mortality in older adults. These public health efforts are probably a significant driving force behind the extensive use of prescription medications, particularly antihypertensive and statin medications, among older adults, many of whom report the use of 5 or more medications and supplements.⁶ Antihypertensive and statin medications are known to affect physiological parameters related to motor function.^{7,8} Although many older adults receive these medications,⁶ there are few studies that have examined the association between these medications and motor function in very old adults. Furthermore, prior observational studies have not reported a consistent association between individuals who use these medications and motor function in older adults.^{7,9,10}

We used data from more than 1500 participants in the Rush Memory and Aging Project, a community-based study of risk factors for common chronic conditions of aging, to assess whether the use of antihypertensive or statin medications is associated with the level of motor function in community-dwelling older adults.

Methods

Participants

All participants were from the Rush Memory and Aging Project, a community-based, longitudinal clinical-pathologic investigation of chronic conditions of old age. Participants were recruited from more than 40 residential facilities across the metropolitan Chicago area, including subsidized senior housing facilities, retirement communities, and retirement homes, in addition to social service agencies and Church groups. Participants agreed to annual detailed clinical evaluations, and all evaluations were performed at the parent facility or the participants' homes to reduce burden and enhance participation. The study was conducted in accordance with the latest version of the Declaration of Helsinki and was approved by the Institutional Review Board of Rush University Medical Center.

The Memory and Aging Project began in 1997 and through July, 2013 enrolled 1635 participants. Eligibility for these analyses required completed review of medications and baseline motor assessment. We excluded 115 cases (7%) that had not completed their baseline assessment or were missing a valid motor evaluation or medication review, leaving 1520 individuals for these analyses.

Assessment of Antihypertensive and Statin Medications

At baseline, study personnel recorded data regarding medication use by direct visual inspection of all containers of prescription and over-the-counter medication allowing for the documentation of all medications taken for at least the 2 weeks prior to the evaluation. Medications were subsequently coded using the Medi-Span Drug Data Base system. A master list of medications defined as having antihypertensive properties (including beta blockers, calcium channel blockers, angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, diuretics) and statins was constructed. For these analyses, we stratified participants into 2 groups. The analysis of antihypertensive medications compared participants who used 1 or more antihypertensive medications with participants not using any antihypertensive medications. The analysis of statin medication compared participants using statin medication with participants not using statin medication.

Assessment of Motor Function

Motor performance was assessed by a battery of 11 tests including bilateral grip and pinch strength, bilateral Purdue Pegboard score, bilateral tapping score, gait (time and number of steps to walk 8 feet

and turn 360°), and balance (time to stand on each leg and then on toes for 10 seconds and the number of steps off line when walking an 8 foot line in a heel to toe manner). These 11 performances were scaled and averaged to obtain a summary global motor score as previously described.³

Clinical and Cognitive Testing

Participants underwent a uniform structured clinical evaluation, including a medical history, neurologic examination, and cognitive performance testing. Details of the clinical evaluation have been described.¹¹ Cognitive function was assessed at each evaluation by a battery of 21 tests. Participants were evaluated in person by a physician, who used all available cognitive and clinical testing results to diagnose dementia. The diagnosis of dementia followed the criteria of the joint working group of the National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer's Disease and Related Disorders Association.¹²

Other Covariates

Demographic characteristics, such as age, sex, and education (reported highest grade or years of education), were obtained at baseline. Medical history (including smoking history, hypertension, diabetes, stroke, congestive heart failure, myocardial infarction, and intermittent claudication) was obtained by a detailed interview by trained personnel, as well as medical examinations (for stroke) and inspection of medications (for diabetes).

Statistical Analysis

We employed *t*-test and χ^2 to compare the clinical characteristics of individuals who used or did not use antihypertensive or statin medications. We used linear regression models to examine the association between medications and global motor score. To examine the association between the number of medications and global motor score, we employed Kruskal-Wallis with post-hoc Mann-Whitney tests, with Bonferroni corrections for multiple comparisons.

Multiple linear regression models were used to study the association between antihypertensive medication or statin medication, motor function, and other covariates. In addition, subgroup analyses were performed to study the associations between the different pharmacologic classes of the antihypertensive medications and motor function. Models were examined graphically and analytically and assumptions were judged to be adequately met. Data were analyzed using SPSS Statistics v 20 (IBM Corporation, Summers, NY).

Results

Descriptive Properties of Antihypertensive and Statin Medication Use

These analyses included 1520 elderly participants. About 60% of the participants used antihypertensive medication ($n = 925$; 60.9%), 365 (24%) used 1 medication, 331 (22%) used 2, and 229 (15%) used 3 or more medications. About 30% used statin medication. Over 20% of the participants used both antihypertensive and statin medications.

Individuals using antihypertensive medication were older than those not receiving medication. Individuals with antihypertensive medication and individuals with statin medications were less educated and had more vascular risk factors and diseases, compared with individuals not using these medications (Tables 1 and 2). There were no significant differences in terms of gender between the groups.

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