Alzheimer's & Dementia 12 (2016) 556-564

Featured Article

Motoric cognitive risk syndrome and risk of mortality in older adults

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Abstract

Introduction: Cognitive impairment is associated with increased mortality. We examined the association between motoric cognitive risk (MCR) syndrome, a predementia syndrome characterized by slow gait and cognitive complaints, and survival.

Methods: A total of 11,867 nondemented participants aged >65 years from three established cohort studies in the United States and Europe were screened for MCR. Mortality risk of MCR was assessed with Cox and logistic regression models.

Results: At baseline, 836 (7.0%) participants had MCR. Over a median follow-up of 28 months, 1603 participants died (758 in first 2 years). MCR was associated with increased mortality overall (adjusted hazard ratio, 1.69; 95% confidence interval [CI], 1.46–1.96) and 2-year mortality (adjusted odds ratio, 1.89; 95% CI, 1.50–2.38). The association remained after accounting for established mortality risk factors as well as baseline gait speed and memory performance.

Discussion: MCR is associated with increased mortality. Older adults should be screened for MCR to identify at-risk individuals for dementia and death.

Keywords: Motoric cognitive risk syndrome; Mortality; Cognitive impairment; Gait speed; Dementia; Predementia syndromes

1. Introduction

Even mild levels of cognitive impairment, independent of dementia, are reported to predict mortality [1–5]. The magnitude of the mortality risk associated with cognitive impairment is comparable with other leading causes of death including heart failure and diabetes [6]. Motoric cognitive risk (MCR) syndrome, a recently described predementia syndrome characterized by slow gait with cognitive complaints, has been implicated as a major predictor of cognitive decline and dementia in older adults [7–9]. In a study involving over 26,000 older adults from 17 countries, MCR was common, occurring in 9.7% of participants, and was associated with a twofold risk of cognitive decline and dementia [8]. Incidence rates for MCR were reported to be 65.2 per 1000 person-years in adults aged ≥60 years.

To better understand the public health impact of MCR syndrome, it is important to establish its mortality risk. Establishing this relationship might also provide essential insights into the pathogenesis of MCR. Hence, we examined mortality risk in 11,867 older individuals enrolled in three well-established population-based cohorts, two in the United States and a multinational cohort from 11 European countries. Gait speed is reported to be a robust predictor of survival in aging [10–12]. Therefore, we examined the predictive value of MCR over its individual components and other established mortality risk factors.

2. Methods

Participant data came from three established cohort studies including 11,867 older adults who were assessed for gait speed and cognitive complaints. All studies received

The authors disclose no conflicts of interest.

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http://dx.doi.org/10.1016/j.jalz.2015.08.167

approval from their individual institutional review boards. The Einstein institutional review board approved the secondary analysis of data from these three studies.

2.1. Study populations

Participant data from the Health and Retirement Study (HRS), National Health and Aging Trends Study (NHATS), and Survey of Health, Ageing, and Retirement in Europe (SHARE) were included. The NHATS and SHARE were designed and modeled after the HRS. These studies and others participate in an ongoing effort to harmonize data for cross-national comparisons [13–15]. Individual study goals, recruitment methods, and target populations have been published [16–18]. All three studies are comparable in their assessment of gait, cognitive complaints, and vital status as well as other demographic and health status characteristics.

The HRS is a nationally representative US cohort study of adults born between 1931 and 1941 [16,19–22]. HRS is sponsored by the National Institute on Aging (NIA; U01AG009740) and conducted by the University of Michigan. Further details of HRS recruitment and study design are published [16,19–22]. Half of the HRS cohort was randomly selected to receive physical performance tests in 2006 [20–22]. Participants aged >65 years who were ambulatory received timed walks. Of the 4686 in the total sample, 3977 were eligible for this analysis. Reasons for exclusion included self- or proxy-reported dementia diagnosis at baseline (n = 68), refusal (n = 118), safety concerns (n = 194), cognitive or physical limitations (n = 90), space constraints or equipment malfunction (n = 155), inaccurate walk time (n = 7), missing timed walk data (n = 40), or missing follow-up data (n = 37). Excluded participants were older (75.5 vs. 74.1 years, $P < .001$) and the majority were female (61.6 vs. 56.4%, $P = .009$).

The NHATS, which began in 2011, is a US sample of Medicare beneficiaries ages >65 years who are assessed annually through face-to-face interviews [17,23,24]. NHATS is conducted through a cooperative agreement with the Johns Hopkins Bloomberg School of Public Health and sponsored by the NIA (U01AG032947) [23]. Details of the NHATS sample are reported elsewhere [17,23,24]. Of the 6795 in the total sample, 5865 were eligible for this analysis. Reasons for exclusion included self- or proxy-reported dementia diagnosis at baseline (n = 297), inability to complete timed walk (n = 198), space constraints (n = 293), safety concerns (n = 29), inaccurate walk time (n = 3), or missing cognitive complaint data (n = 96). Excluded participants were older (80.1 vs. 76.7 years, $P < .001$), but there was no gender difference (58.7 vs. 57.2% female, $P = .378$).

The SHARE is a multinational sample of adults aged ≥50 years from 20 European countries [13,18,25–27]. Participants from a subset of 11 countries with longitudinal assessments were selected for the current analysis. The SHARE has been primarily funded by the European Commission, the NIA, the German Federal Ministry of Education and Research, and other sources [13,18,26]. Ambulatory participants aged >75 years received timed walks. Of the 4559 in the total eligible sample, 2025 were included in this analysis. Reasons for exclusion included refusal (n = 524), bed or wheelchair bound (n = 130), incomplete walks because of cognitive impairment (n = 276), physical limitation (n = 341), inability to understand instructions (n = 17), health or safety concerns (n = 442), space constraints (n = 30), missing walking speed (n = 56), or unknown vital status at follow-up (n = 478). A high incidence of cases with unknown vital status over follow-up has been reported in SHARE [28]. Because dementia diagnosis is not reported in the baseline SHARE assessment; we defined dementia algorithmically using a composite score derived from the baseline cognitive test performance [29]. Scores on tests for memory, orientation, and executive function were z-transformed; the mean of these scores was calculated, then the overall mean was standardized [29]. Dementia was defined as a score two or more standard deviations (SD) below the mean on the composite cognitive test score. Similar procedures to diagnose dementia have been reported in other cohorts [29]. Applying this operational definition, 240 participants with dementia at baseline were excluded. Excluded participants were older (82.2 vs. 81.0 years, $P < .001$) and the majority were female (62.0 vs. 55.7%, $P < .001$).

2.2. Motoric cognitive risk

MCR diagnosis builds on current definitions of mild cognitive impairment (MCI) [30], substituting the objective cognitive impairment criterion based on cognitive tests used in MCI with the criterion of slow gait. MCR is defined as presence of subjective cognitive complaints and slow gait in older individuals without dementia or mobility disability [7–9]. Cognitive complaints were elicited from participants based on responses to standardized questionnaires (Table 1) [7]. Gait speed was measured as participants were timed walking at their normal pace over a fixed distance, and speed (m/s) calculated. Additional details on the timed walk protocols in the individual cohorts are published [16,17,27]. Slow gait was defined as walking speed ≥1 SD below age- and sex-specific means within each cohort to overcome variability in populations and procedures [7–9,31]. Table 1 lists slow gait cutscores and procedures used to diagnose MCR in the individual studies.

2.3. Ascertainment of death

2.3.1. Health and Retirement Study

Participants were assessed biannually between 2006 and 2012. Death date was obtained from the decedent's spouse,