



Featured Article

Increased risk for dementia both before and after stroke: A population-based study in women followed over 44 years

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Abstract

Introduction: Longitudinal studies are needed to understand the long-term associations between stroke and dementia.

Methods: A population sample of 1460 women without stroke or dementia at baseline was followed over 44 years, from 1968 to 2012. Information on stroke and dementia was obtained from neuropsychiatric examinations, key-informant interviews, hospital registry, and medical records.

Results: During 44 years follow-up, 362 women developed stroke and 325, dementia. The age-specific incidence of the two disorders was similar. The incidence of dementia was higher in those with stroke than among those without (33.7% vs. 18.5%; age-adjusted hazard ratio 1.44, 95% confidence interval 1.15–1.81). The increased risk of dementia started already 5 years before stroke, was highest 1 year after stroke, and continued more than 11 years after stroke.

Discussion: There is an increased risk for dementia both before and after stroke. This has implications for understanding the relation between the two disorders and for prevention of dementia and stroke.

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Keywords:

Stroke; Dementia; Longitudinal study; Population-based study; Women

1. Backgrounds

Stroke and dementia are common disorders in the elderly. A number of studies have reported an increased risk of dementia after stroke [1–8]. The prevalence of dementia 1 year after stroke is reported to be 7%–23% [2,9,10]. Recent studies suggest that early-onset poststroke dementia mainly results from a complex interplay between stroke lesion features, Alzheimer's disease pathologies, and brain resilience, whereas delayed-onset poststroke dementia is mainly associated with severe small vessel diseases, and to lesser extent with Alzheimer's disease pathologies [11–13]. It is well known that the risk of dementia is

increased shortly after stroke. However, little is known about the long-term risk of dementia among stroke survivors, as few studies have investigated risk of dementia more than 5 years after stroke [1,4]. One study reported a doubling of the risk uniformly over 10 years after stroke [1], and the other reported an increased risk up to 5 years after stroke [4]. A prospective study of more than 23,000 participants showed that incident stroke was associated with an acute decline in cognitive function and also persistent cognitive deficits over 6 years [14].

Dementia is also common before stroke. Based on retrospective information, the prevalence of dementia before stroke is estimated to be 8%–16% [2,15,16]. Prestroke dementia was associated with female gender, lower education, cerebral atrophy, multiple infarcts, diabetes, and atrial fibrillation [8,16]. A limited number of studies have examined risk of dementia before stroke compared with people free from stroke. One longitudinal population study with 10 year follow-up reported that memory decline started

Competing interests: I.S. has been advisor and speaker for Takeda. Other authors declare that they have no competing interests.

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already several years before stroke and that the decline accelerated after the index stroke [17]. Stroke survivors had faster memory decline both before and after stroke compared with stroke-free adults [17].

Ideally, studies on the relation between stroke and dementia should be performed in large population samples followed over a long time, allowing enough dementia cases to occur at different time periods in relation to the index stroke, that is, short and long time before stroke as well as short and long time after stroke. We examined the risk of dementia before and after stroke in a large population of women followed over 44 years.

2. Methods

2.1. Study population

The study is part of the Prospective Population Study of Women in Gothenburg [18], which was initiated in 1968. Women born in 1908, 1914, 1918, 1922, and 1930 were systematically sampled from the Swedish Population Register. Follow-ups were performed in 1974–1975, 1980–1981, 1992–1993, 2000–2001, 2005–2006, and 2009–2011 (Fig. 1). Seven women with stroke or transient ischemic attack (TIA) before examination in 1968 were excluded, leaving 1460 women for the present study (age 38, $n = 371$; age 46, $n = 433$; age 50, $n = 397$; age 54, $n = 180$; age 60, $n = 79$). None of the women had dementia in 1968. The examinations included neuropsychiatric and physical examinations, psychometric testing, key informant interviews, ECG, and blood sampling.

The study was approved by the Regional Ethical Review Board at the University of Gothenburg. All participants gave informed consent to participate, in accordance with the provisions of the Helsinki Declaration.

Neuropsychiatric examinations were performed by experienced neuropsychiatrists in 1968–1969, 1974–1975, 1980–1981, and 1992–1993 and by experienced psychiatric research

nurses in 2000–2001, 2005–2006, and 2009–2011. All examinations were semi-structured, allowing for clarifying questions, and included a comprehensive psychiatric interview and observations of mental symptoms during the interview, as described previously [19,20]. The examinations included ratings of common signs and symptoms of dementia, for example, assessments of memory, orientation, general knowledge, apraxia, visuospatial function, understanding of proverbs, following commands, naming ability, and language. These examinations used identical instruments, including the Comprehensive Psychopathological Rating Scale, Gottfries-Bråne-Stein Scale, the Mini-Mental State Examination, the Alzheimer's Disease Assessment Scale, and the Clinical Dementia Rating, for more than 4 decades of follow-up. The last author (I.S.) came into the studies in 1983 and trained the examiners from 1992 to 2012. Interrater agreements between psychiatrists and psychiatric research nurses for the signs and symptoms of dementia were between 89.4% and 100.0% (kappa values between 0.74 and 1.00).

Close informant interviews were performed by psychiatric nurses since 1992. The interviews were semi-structured and comprised questions about changes in behavior and intellectual function, psychiatric symptoms, activities of daily living, and, when relevant, age at onset for stroke and dementia, and disease course.

Medical records on all women were collected from all inpatient and outpatient departments and general practitioners' offices in Gothenburg. The Swedish Hospital Discharge Register provided information on diagnoses of all individuals discharged from hospitals on a nationwide basis since 1978. Diagnoses are classified according to the International Statistical Classification of Diseases and Related Health Problems (ICD).

2.2. Diagnoses of dementia

Dementia was diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders-III-R criteria, as described previously [19,20]. For participants in the neuropsychiatric examinations, dementia diagnoses were made by neuropsychiatrists after reviewing information from both neuropsychiatric examinations and the close informant interview. The diagnosis was made if the participant had dementia according to both sources of information, or if there was clear evidence of dementia from one source and subthreshold symptoms from the other. For individuals lost to follow-up, dementia diagnoses were based on information from medical records evaluated in consensus conferences and from the Hospital Discharge Register. In total, 325 cases of dementia were diagnosed (95 from hospital register and/or medical records only; 119 from clinical examination and/or close informant interview only; and 111 according to both sources). Among those with dementia, 161 had Alzheimer's disease, 46 vascular dementia, 84 mixed dementia, and 34 other types of dementia.

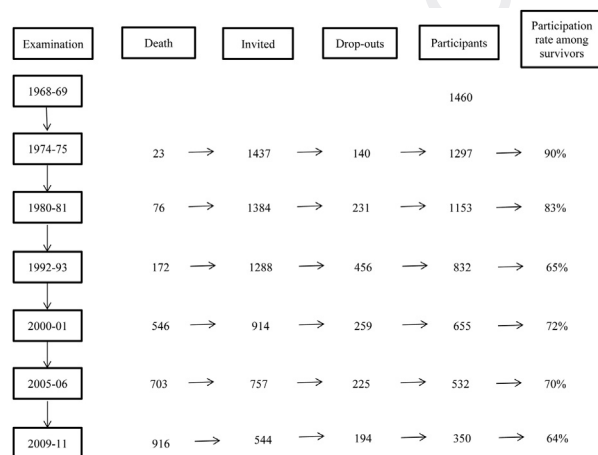


Fig. 1. The Prospective Population Study of Women in Gothenburg.

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