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Analysis of Conversion Factors from Three Type of MCI to Dementia Using Long-term Care Service Data

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Introduction

By using the grade of long term care service, we can indirectly see the transition from amnesic mild cognitive impairment (aMCI) to dementia. The purpose of the study was to investigate the factors affecting the conversion of aMCI to dementia using data of long term care services and to identify deterioration factors of cognition.

Methods

Based on the Clinical Research Center for Dementia (CRCD) cohort registry from 2005 to 2013, we made a new cohort by merging it with the data from long term care service of National Health Insurance Service(NHIS). We enrolled 3569 patients with aMCI who satisfied the criteria : 1) presence of memory complaints 2) intact function in activities of daily living (ADL); (3) objective cognitive impairment (at least 1.0 standard deviation [SD] below age- and education-adjusted norms) in more than one cognitive domain on standardized neuropsychological testing. All participants completed a complete medical interview, clinical dementia rating (CDR), and brain MRI scan. We obtained information about the age, sex, education, income level, and accompanying diseases (hypertension, diabetes, hyperlipidemia) of the participants. Also, we figured out whether or not patients get were receiving the long-term care service. Transaxial T2 and FLAIRS images of brain were obtained using a 1.5T MRI scanner. We classified the severity of white matter hyperintensity(WMH) change on MRI according to the criteria of Table 1. The patients were classified according to the severity of white matter hyperintensity(WMH) change: aMCI, aMCI with moderate WMH change(aMCI with), aMCI with sever WMH change(svMCI).

Results

Baseline characteristics of the participants are summarized in Table 2. The number of women was about two times higher than that of men, and statistically significant. ($p = 0.016$). Education period tended to be shorter in the group of severe ischemic change. When comparing the time period of receiving long term care service, hazard ratio of aMCI with was 1.27 based on aMCI, but it was not statistically significant. In the case of svMCI, the time period of receiving long term care service was 1.29 and statistically significant compared with aMCI. (Table 3, Figure1). We sought to determine what factors predicted incident dementia. Severe baseline WMH change, advanced age, female, long educational period, higher CDR scores at baseline significantly predicted dementia in univariate analysis. In multivariate analysis, severe WMH change, advanced age, female

and higher CDR scores at baseline significantly predicted progression to dementia

Conclusions

Our findings suggest that severe WMH change, advanced age, female and higher CDR scores at baseline were significant factors that predict progression from MCI to dementia.

Table 1. Criteria of white matter hyperintensity(WMH) change severity

	D1(<10mm)	D2(in between)	D3(≥25mm)
P1(Capping/Banding, both<5mm)	Minimal	Moderate	Moderate
P2(inbetween)	Minimal	Moderate	Moderate
P3(Capping/Banding, either≥10mm)	Moderate	Moderate	Severe

Table 2. Demographic data of aMCI classification

	aMCI (n=2501)	MCI with (n=856)	svMCI (n=212)	p-value
Age	68.1±8.5	72.3±7.0	72.5±6.3	<0.001
Male, n(%)	804(31.7)	319(36.8)	66(30.1)	
Female, n(%)	1697(68.3)	537(63.2)	146(69.9)	0.016
Education period	7.8±5.2	7.3±5.1	6.9±5.3	0.011
MMSE	24.3±4.0 (n=677)	24.2±3.8 (n=299)	23.2±4.7 (n=88)	0.054
CDR	0.48±0.09	0.49±0.08	0.48±0.11	0.31

Table 3. Survival analysis from the first day of diagnosis as aMCI patient due to WMH change to the first day of receiving long term care service

aMCI classification	Median time*	Hazard ratio (95% CI)	p-Value
aMCI	Ref	Ref	
aMCI with	89.475-82.623	1.27 (0.96-1.68)	<0.0998
svMCI	112.328-105.508	1.29 (1.09-1.53)	<0.0031

Table 4. Factors that affect receiving long term service for aMCI patients

	OR	95% CI		p-value
		Lower	Upper	
Disease				
aMCI	Ref			
aMCI with	1.4	1.186	1.653	<0.0001
svMCI	1.332	1.00518e	1.765	0.0459
Age at diagnosis				
>65	Ref			
≤65	3.201	2.482	4.126	<0.0001
Sex				
Men	Ref			
Women	1.445	1.197692	1.766249	0.0001
Educational period	1.004	0.987771	1.019727	0.6554
CDR	4.76	1.274933	17.76955	0.0203

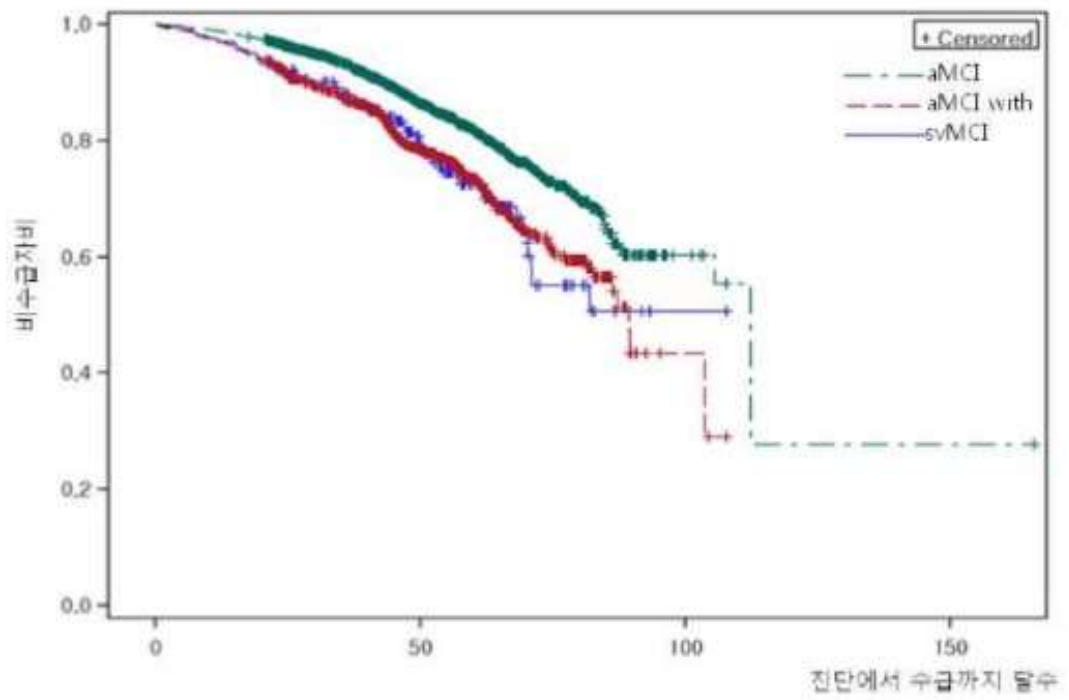


Fig 1. Kaplan-Meier Graph from the first day of diagnosis as aMCI patient due to WMH change to the first day of receiving long term care service