THE ROLE OF ACTIVITIES OF DAILY LIVING IN THE MCI SYNDROME

R. PERNeczky, A. Kurz

Department of Psychiatry and Psychotherapy, Technical University of Munich, Germany. Correspondence Address: Dr. med. Robert Perneczky, Klinik und Poliklinik für Psychiatrie, Technische Universität München, Ismaningerstr. 22, 81675 München, Germany, Tel: +49(89)4140-4279, Fax: +49(89)4140-4923, Email: robert.perneczky@lrz.tum.de

Abstract: Mild cognitive impairment (MCI) is a state between age-associated cognitive decline and dementia and therefore often a prodromal state of Alzheimer's disease. Current diagnostic criteria for MCI exclude the impairment of activities of daily living (ADL). However, there is evidence that complex ADL are already impaired in very early stages. Therefore, we explored if ADL are impaired already in the stage of MCI, which ADL are vulnerable to subtle cognitive changes in particular, and if ADL are correlated with demographic or clinical factors or severity of clinical symptoms. Furthermore, we examined the use of the assessment of complex ADL for the separation of MCI patients from healthy controls and the course of everyday activities over the time period of one year. Our results demonstrate that ADL requiring memory or complex reasoning are impaired in particular in MCI patients compared to healthy, age-matched controls and that the impairment is not related to demographical variables and the number of cognitive domains affected or severity. Furthermore, our findings show that the assessment of complex ADL may complement cognitive tests for the differentiation of MCI patients from controls and that MCI patients experience a significant deterioration in their everyday function over the time course of one year. We conclude that the progression from MCI to dementia is continuous and that current diagnostic criteria are oversimplified although useful for pragmatic reasons.

Key words: ADL, Alzheimer's disease, dementia, mild cognitive impairment.
Clinical and neuropathological studies suggest that Mild Cognitive Impairment (MCI) is a state between age-associated cognitive decline and mild dementia. At autopsy, the majority of patients with MCI show typical features of Alzheimer’s disease (AD). Therefore, MCI frequently represents a prodromal stage of AD. MCI covers a cognitive spectrum which falls between physiological age-associated cognitive decline and dementia. According to current diagnostic criteria, MCI can be distinguished from normal cognitive ageing by a significantly lower performance on tests of memory or other cognitive functions. Moreover, MCI differs from mild dementia by intact global intellectual abilities and preserved activities of daily living (ADL). However, the population of patients diagnosed according to these criteria is highly heterogeneous in terms of aetiology, clinical symptoms, and prognosis. On average, patients with MCI progress to dementia at an annual rate of 12-15 per cent, but rates of more than 40 per cent have also been reported, as well as subgroups of patients who do not continue to go on to dementia or even revert to normal.

The transition from MCI to dementia is probably continuous in terms of neuropathology and clinical symptoms. Autopsy studies have found a wide variation in the severity of AD-typical features, suggesting that patients gradually accumulate neuropathological changes as they progress from MCI to dementia. Moreover, more than one cognitive domain may be affected in MCI, and patients accumulate cognitive deficits in the course of the disease which gradually leads to a general intellectual deficit typical for AD. There is also evidence that complex ADL may already be impaired in the stage of MCI, whereas, by definition, loss of basic ADL indicates that the clinical stage of dementia has been reached. Complex ADL such as taking care of medication, handling finances, and keeping appointments seem especially vulnerable to subtle cognitive changes. However, little is known about the impairment of ADL in the stage of MCI.

Our studies in this field of research were conducted as part of a national collaboration on dementia (Kompetenznetz Demenzen [1]) and were in part funded by the Federal Ministry of Research and Education (grant No 01GI0420). The sponsor played no role in the design, analysis, and interpretation of the present studies. MCI was diagnosed according to the diagnostic criteria developed for this particular network. Those criteria differ from the most frequently used criteria [2] in two respects. The definition of MCI used does not require subjective memory complaints since they are a rather poor predictor of memory impairment. Furthermore, our criteria specify the degree of ADL impairment that is consistent with the diagnosis of MCI. Deterioration of complex ADL is compatible with this diagnosis, whereas loss of basic activities is clearly excluded. Diagnostic procedures were based on the Consortium to Establish a Registry for
Alzheimer's Disease Neuropsychological Assessment Battery. It was complemented by tests of episodic memory (Wechsler Memory Scale Logical Memory), information processing speed (Trail Making Test A), language, constructional ability (Clock Drawing Test), and executive function (Trail Making Test B). Interviews were conducted with the patients' proxies using the Informant Questionnaire on Cognitive Decline in the Elderly to verify deterioration of cognitive ability from a previously higher level. The Bayer-ADL scale was used for the assessment of basic ADL. Severity of cognitive decline was rated on the Clinical Dementia Rating scale. The impairment of complex ADL was rated on the Alzheimer's Disease Cooperative Study scale for ADL in MCI (ADCS-MCI-ADL) by an independent rater within four weeks after the first study visit. The Alzheimer's Disease Assessment Scale, cognitive subscale (ADAS-cog) was administered to obtain additional information on the patients' cognitive abilities. Physical examination, laboratory screening, and structural brain imaging were also part of the diagnostic work-up.

Our first study [3] included 48 MCI patients of the mentioned network and 42 cognitively healthy controls without memory complaints who were unrelated to the patients (spouses) and were also recruited from our unit. The objectives were to examine whether patients with MCI are impaired on ADL, which ADL are involved in particular, and whether limitations on ADL are associated with demographic variables, severity of symptoms or the number of cognitive domains affected. We showed that the overall score of the ADCS-MCI-ADL scale was significantly lower in the group of MCI patients than in the control group (mean value 40.95, standard deviation 9.81 vs. mean value 55.43, standard deviation 2.13, p < 0.001). Furthermore, patients performed significantly worse after statistical correction for multiple comparisons on 14 out of the 18 ADL covered by the interview. They were particularly impaired in activities requiring memory or complex reasoning such as checking the bank account, writing letters, or talking about recent events whereas there was no significant difference in basic ADL, such as putting on clothes and using household appliances. Moreover, there was no significant association between the ADCS-MCI-ADL overall score and demographical variables or the number of cognitive domains affected. However, MMSE and ADCS-MCI-ADL scores were moderately, but significantly associated (Spearman's rho 0.37, p = 0.016).

A second analysis [4] including 45 patients and 30 age-matched controls from the same network was designed to evaluate the accuracy of the ADCS-MCI-ADL for the discrimination between MCI patients and healthy controls in comparison to the ADAS-cog. Furthermore, we tried to prove that the contribution of the assessment of ADL to the separation of MCI subjects from cognitively healthy controls is equal to that of a cognitive test. The
results of receiver operator curve (ROC) analyses showed that both instruments discriminated well between patients and controls (ADCS-MCI-ADL: sensitivity 0.89, specificity 0.97 at a cut-off at 52 points; ADAS-cog: sensitivity 0.78, specificity 1.0 at a cut-off at 10 points) and that the test accuracy of the ADCS-MCI-ADL was slightly superior to the accuracy of the ADAS-cog (area under the curve 0.97 vs. 0.93). With regard to the logistic regression equation built by adding the two tests stepwise to a null model, both ADCS-MCI-ADL and ADAS-cog were strong predictors of caseness according to the expert diagnosis as the gold standard.

In addition to these findings, the preliminary results of a third longitudinal study including 24 MCI patients of our network showed that there was a significant decline on the ADCS-MCI-ADL overall score over the time period of one year (mean value 46.73, standard deviation 8.12 vs. mean value 39.55, standard deviation 12.36, p = 0.017; \( \Delta \) mean value 7.18, standard deviation 3.56) suggesting that the longitudinal assessment of complex ADL may serve as a measure for the course of MCI. However, the high variability of the data illustrates the prognostic heterogeneity of MCI.

Our findings demonstrate that MCI patients as a group perform significantly poorer than age-matched cognitively unimpaired controls on complex ADL. This finding is consistent with studies that report that patients with questionable dementia are more impaired on informant-reported ADL than controls. Patients were in particular impaired on ADL demanding memory or complex reasoning and there was not a single patient without any impairment on ADL.

Furthermore, we showed that the assessment of complex ADL may serve as a part of the diagnostic procedures in MCI and that it may complement cognitive tests since informant-reported ADL and cognitive tests contributed equally to the differentiation between MCI patients and cognitively healthy controls. Our preliminary finding that there is a significant worsening of ADL within one year indicates that the assessment of complex ADL might be useful for prognostic conclusions and denote a patient’s position on the scale between MCI and dementia.

In conclusion, our findings suggest that current diagnostic criteria for MCI which exclude the impairment of ADL may be oversimplified, although useful in a pragmatic point of view. Moreover, our results underline that there is no sharp borderline between MCI and mild dementia. The two syndromes mostly represent two overlapping stages of the same underlying disease and the progression is continuous. Therefore, it may be difficult or sometimes even impossible to decide whether progression from MCI to dementia has already occurred in an individual patient. The finding that the impairment of ADL is independent from the number of cognitive domains affected highlights that the deterioration on
one cognitive domain may be sufficient to interfere with everyday life. Further extensive research is needed to explore the role of ADL in the MCI syndrome in more detail.

REFERENCES