MILD COGNITIVE IMPAIRMENT

Functional Limitations Predict Future Decline in Mild Cognitive Impairment

Abstract

Mild Cognitive Impairment (MCI) is a term used to describe the transitional stage between normal aging and dementia, wherein changes in cognitive abilities are limited enough to maintain independence. Although the degree of functional impairment present does not yet warrant a diagnosis of dementia in MCI, there are subtle changes in everyday activities that may indicate the presence of an underlying neurodegenerative condition. The goal of this paper is to review the types of functional changes that are detectable in MCI and the prognostic value of assessing everyday functioning in this population.

Keywords: MCI, Functional Impairment, ADL, Dementia, Aging

The Nature of Functional Limitations in MCI

Mild Cognitive Impairment (MCI) is a syndrome that describes the transitional state between normal aging and dementia.¹ This characterization has gained wide acceptance as a clinical syndrome in the field because it is associated with increased risk for developing further cognitive decline.² While the definition of MCI originally considered daily function to be “normal”, more recent diagnostic criteria have acknowledged that mild functional changes can be apparent in this syndrome.³ Cross-sectional studies indicate that there are varying degrees of change in everyday activities that differ among the stages of normal aging, MCI, and dementia.⁴,⁵,⁶,⁷,⁸,⁹ More specifically, those with MCI have more functional limitations than normal aging individuals, but less than those

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with dementia or moderate to severe cognitive impairment. However, guidelines remain unclear as to what degree of functional change differentiates normal aging, MCI, and dementia. To gain a sense of how clinicians distinguish MCI from dementia in relation to the nature and/or degree of functional impairment present, we recently surveyed neurologists and neuropsychologists from federally funded Alzheimer’s Disease Research Centers. While variability existed among the experts, the general consensus was that dementia is most typically diagnosed in the context of complete loss of independence in one or more major domains of everyday life (i.e. managing financial affairs or utilizing transportation). Alternatively, functional changes associated with MCI should be relatively mild and limited in scope. For example, although some degree of assistance from others may be necessary (i.e. an individual with MCI may need help completing some of their financial transactions, they may need occasional reminders to take medications, etc.), these changes should not result in loss of independence in major functional domains of life.

The Disablement Process Model has been used to conceptualize the various stages that lead to the loss of independence/disability within a developing disease process such as Alzheimer’s Disease. The model describes four phases (see figure) in which a disease process or ‘pathology’ develops (i.e. Alzheimer’s pathology) leading to ‘impairments’ (i.e. neuropsychological deficits such as a memory impairment). These impairments, in turn, can lead to ramifications in real-world function in the form of ‘functional limitations’ (i.e. mild functional changes related to impairments). Eventually, these limitations and cognitive impairments worsen to the point that the ability to function independently in major domains of life becomes compromised (disability). According to this model there is a hierarchical, although overlapping, relationship between functional limitations and disability.

Guided by the disablement model described above, the Everyday Cognition Questionnaire (ECog) was developed to identify types of subtle functional changes that can be present before the disability. Using the ECog, we have identified a variety of

**Figure 1:** The Disablement Process Model as Proposed by Verbrugge and Jette (1994)
A number of other recent studies have also shown that mild functional changes are detectable in the preclinical stages of a neurodegenerative disease. These alterations can be mild and even relate to subtle changes in the speed or accuracy with which someone carries out their various everyday activities. Other examples of functional changes include difficulty using appliances, operating basic electronic equipment such as a remote control and organizing paperwork.

MCI is comprised of a heterogeneous group – depending on the subgroups included, individuals with MCI may differ in both the degree and domain of cognitive impairment. Additionally, the underlying etiology of the cognitive impairment varies, although it is presumed that in many cases (particularly those with an amnestic pattern) early Alzheimer’s disease is present. MCI is also heterogeneous in terms of progression – some individuals progress to dementia (i.e. in clinical samples this can be as high as 10-12% per year), some remain stable over long periods, and some actually revert back to normal. There are now a number of studies which show that the presence of functional impairment is associated with an increased risk of continued cognitive decline at follow up and conversion to dementia. In one such study, researchers followed older adults over the course of 10 years. MCI participants with problems in at least two activities of daily living (i.e. telephone, transportation, medication, and finances) at baseline

**Table 1: Examples of Impaired Everyday Activities**

### Impairments in Everyday Activities in MCI

**Everyday Memory**
- Remembering items on a shopping list
- Recalling conversations
- Remembering appointments/meetings/engagements

**Everyday Planning**
- Planning an outing or a social event
- Thinking ahead and thinking things through before acting
- The ability to develop a good strategy in a game of skill

**Everyday Organization**
- Balancing the checkbook without errors
- Assembling/organizing financial records, tax documents, business records

Functional limitations that occur in MCI. Table 1 summarizes common examples of subtle changes in everyday activities in MCI that were identified using the ECog.

Key Point
 Functional changes are strong predictors of conversion to dementia and for determining the rate of progression.
were at increased risk of converting to dementia during the study period compared to those without any functional changes at baseline (OR=2.59, CI=1.24-4.08).30

Identifying older adults who are at risk for decline can be challenging particularly in ethnically diverse populations. One study done by Farias and colleagues evaluated several different baseline predictors of longitudinal decline in cognition.28 They studied a large sample of Hispanic older adults and discovered that more functional impairment at baseline was a significant predictor of future cognitive decline. In fact, in this particular sample, ratings of functional impairment were more predictive of who was going to show cognitive decline at follow-up than baseline cognitive impairment. The measurement of functional impairments in other populations such as those who are African American may also have utility in identifying who is at risk for conversion to dementia.24

**Assessing Functional Limitations in MCI**

There are a number of instruments available that can be used to assess early functional changes. Methods used to assess everyday function include performance-based assessments, self-report, and informant ratings of everyday functioning. While performance-based assessments provide direct observations of someone’s ability to carry out various daily tasks they are impractical in many clinical and research settings. A clinician may obtain information from the patient themselves through self-report measures of daily functioning. It is important to keep in mind that the validity of self reporting can be limited due to diminished insight or fear of loss of independence (i.e. loss of driver’s license). However, in some cases, self-reported cognitive or functional problems can be associated with other indicators of an early neurodegenerative disease.31

Alternatively, a fairly reliable and time and cost efficient approach relies on caregiver or informant ratings (i.e. provided by the spouse, adult child, or someone else who knows the patient well).32-33 The validity of informant reports are maximized if the informant actually lives with the patient.34 In fact, many studies have shown that informant ratings provide reliable estimates of everyday functioning and are often correlated with cognitive psychometric scores of a patient with questionable dementia.35 Nevertheless, there are limitations to informant reports that can lead to inaccurate conclusions about a patient’s capacity for everyday living. For instance, inflated degrees of caregiver distress can lead to over-reporting of problems due to response bias. Previous findings have also shown that caregivers with low mood, minimal resources, and poor health status

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**The validity of informant reports are maximized if the informant lives with the patient.**

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**Key Point**

Functional assessments are time and cost efficient ways of identifying those at risk for dementia.
Table 2: Instruments used to evaluate daily functioning in MCI

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<tr>
<th>Instrument</th>
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<tbody>
<tr>
<td>ADCS-ADL scale</td>
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<tr>
<td>Cognitive Change Checklist (3CL)</td>
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<tr>
<td>Everyday Cognition (ECog)</td>
</tr>
<tr>
<td>Functional Capacities for Activities of Daily Living Scale (FC-ADL)</td>
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<tr>
<td>Instrument Activities of Daily Living Scale</td>
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<td>Informant Questionnaire on Cognitive Decline (IQ Code)</td>
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<td>Naturalistic Action Test (NAT)</td>
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Commonly used informant based questionnaires of everyday function include the Lawton Brody ADL scale, Blessed-Roth Dementia Scale, and the Functional Activities Questionnaire. Each of these instruments inquires about someone’s current ability to engage in multiple aspects of everyday life relative to their previous level of functioning. However, these questionnaires were primarily developed for patients with Alzheimer’s Disease and such methods may not be sensitive enough to detect the subtle/mild declines in everyday functioning that can occur in MCI. Table 2 provides some commonly used instruments to detect the subtle functional changes that can occur in MCI.

Summary and Conclusions

MCI is a clinical syndrome that is considered as a transitional state between normal aging and dementia. Contrary to initial belief, a growing body of literature provides evidence suggesting that functional changes occur in this stage. Although the degree of functional limitations present in MCI are significantly less than what can be seen in dementia, early problems with managing everyday affairs can be strong indicators of an underlying neurodegenerative process. Assessing for functional limitations either through informal discussion or with standardized questionnaires can significantly aid in the early detection of Alzheimer’s disease and other neurodegenerative diseases of aging. Whenever possible this assessment should involve gathering information from individuals who regularly observe the patient and are familiar with how they are functioning in daily life (rather than just relying on self report). In individuals from diverse backgrounds, functional assessments may sometimes provide better estimates of who is at risk for subsequent decline than formal cognitive tests. In addition to diagnostic and prognostic utility, assessment of functional decline can also aid in identifying those who are struggling in their daily life and need additional assistance and/or a higher level of care. Identifying these issues can also encourage patient’s and their families to proactively plan for future care needs.
Functional Limitations in MCI

SUMMARY OF KEY POINTS

There are functional changes that are present in MCI which are beyond what is expected for normal aging.

Functional changes are strong predictors of conversion to dementia and for determining the rate of progression.

Functional assessments are time and cost efficient ways of identifying those at risk for dementia.

Evaluating functional status is a less culturally-biased way of assessing who is at risk for dementia in ethnically diverse populations.

Evaluating functional status should always include an interview with someone who knows the patient well.

References

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Mild Cognitive Impairment (MCI) is a term used to describe the transitional stage between normal aging and dementia.

Mild functional changes in everyday abilities can occur in MCI, and when present are associated with increased risk for further decline and conversion to dementia.

Clinical Pearls

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Predictors of Rate of Longitudinal Cognitive Decline in Hispanic Older Adults. Am J Geriatr Psychiatry 2010.