



REVIEW ARTICLE

Mild Cognitive Impairment and its Diagnosis to Progression to Dementia with Several Screening Measures

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Abstract:

Background:

Mild Cognitive Impairment (MCI) is the stage of an individual's life in which there can be traced a slight amount of decline in cognitive functioning that comprised of memory and thinking skills. This decay in cognitive functioning does not affect the daily functioning of a patient's life as it happens in the case of dementia.

Objective:

To review various forms of screening test measures to assess mild cognitive impairment and its extension towards the gradual onset towards the severe cognitive dysfunctioning such as dementia.

Method:

There are certain functional impairments that are identical to each other. As far as memory and thinking abilities are concerned, its range may vary from minimal to mild that remains quite unnoticed by the person.

Results:

Presently, the impact of medication is not so effective for MCI. Regular practices of exercises, mind activity and social involvement may help in decreasing risk of further cognitive function decline. Patients with MCI may carry greater risks of developing dementia as compared to the general population. The present paper discusses various intervention techniques and screening measures to mitigate the prevalence of MCI and to reduce progression of dementia.

Conclusion:

Prevalence of Mild Cognitive Impairment could be reduced with the primary administration of intervention strategies and technology in order to reduce its progression to dementia. The classification and categorization of MCI is getting broader and clear day by day. The expansion in the use of imaging techniques and other neurological intervention strategies may further enhance the detection of subjects with MCI.

Keywords: Mild cognitive impairment, Nonamnesic, Dementia, Diagnosis, Therapies, Screening measures.

1. INTRODUCTION

Memory impairments underlie certain situations such as remembering the names of those people whom they met recently, difficulty in keeping the things at the right place and other such problems in everyday tasks. Experiencing such situation, an individual may develop cognitive impairments with one or more of the following functions like memory,

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reasoning, planning, decision-making, and attentional dysfunction, language and visual depth perception. These may result in minor problems associated with certain daily-based activities pertaining to paying bills, driving, and similar kind of activities. In order to cope up with problems, patients have to rely on calendars and note making strategies to compensate for any such emerging situations at a certain point of time. However, problems may become major if such cognitive dysfunctioning may significantly affect the everyday activities that give a clear indication of the onset of the occurrence of dementia [1, 2].

MCI may occur due to different possible causes some of which are treatable while some are not. There are certain causes of MCI that are often diagnosed by doctors and therapists treatable such as depression, stress, and anxiety [3]. Whereas, there is another category of symptoms that may be experienced due to physical illness, e.g. eye vision impairment [4], hearing inability [5] or side effects of medication [6]. Various subcategorizations of MCI are identified in previous studies. One such classification consists of amnesic and non-amnesic forms of MCI. In amnesic MCI, memory impairment is an indication of Alzheimer Disease (AD). While non-amnesic MCI contains a huge number of cognitive impairments, the most common among which is the executive function, *i.e.*, inhibition in the facilitation of decision-making ability. In most of the cases of amnesic MCI, pathological changes of AD have not become heavily severe that may cause clinical dementia. Non-amnesic MCI may be associated with cerebrovascular disease, frontotemporal dementias or no specific pathology. It is also of interest to know that possibility of developing MCI is greater in women than in men [7].

It is very important to find out the cause of cognitive impairment. There are certain cases in which patients may develop cognitive impairment due to neurodegenerative diseases, such as, Alzheimer's Disease (AD), Parkinson's Disease (PD), Frontotemporal Lobar Degeneration (FTLD) and amyotrophic lateral sclerosis (ALS). These kind of diseases may show certain symptoms that may represent the report of a patient's diagnosis of major cognitive disorders and impairments such as dementia [8]. However, there are few cases in which the impact of mild cognitive impairment can be reversed. There are several forms of treatments that consisted of intervention strategies from various disciplines. Early diagnosis of cognitive impairment is essential for treatment since all the intervention mechanisms are most effective in the earlier stages of cognitive impairment [9]. It is said that staying active in older age and having good healthy social terms can help prevent some cognitive dysfunctioning issues. In previous studies, the frequency of depressive was found and anxiety symptoms varied along with the severity of dementia. For instance, depressive conditions may prevail more commonly in patients with mild to moderate dementia, while the high level of anxiety may be more frequent in later stages of the disease [10].

As suggestive measures, therapists may help the patients, diagnosed with symptoms of cognitive impairment, to identify and address any underlying medical issues that are present. Several procedures are involved like referring the patients for neuropsychological assessment or medical evaluation. These treatments and assessments will not only help to find the cause of the cognitive impairment but can also rule out any other medical issues from rising ahead that could be contributing to the symptoms, such as, a stroke or brain tumor that may further appear to be the cause of progression to dementia.

1.1. Review of Intervention Strategies and Therapies

Patients suffering from cognitive impairment may experience comorbid mental health issues, such as depression, anxiety, and agitation. Thus, treating these patients with suggested measures and treatments may be helpful to improve overall health issues. Several strategies and behavioural therapies have been recommended by medical fields to help individuals cope with cognitive impairment. Involving the patient's family members during these therapeutic sessions may also prove to be beneficial and supportive to them. Presence of the closed ones can be helpful not only to the patients but also to family members. This will enable the family members to prepare for and cope with the changes cognitive impairment may bring about in the person's life and daily work.

World Health Organization [11] has declared the Cognitive Behavioural Therapy (CBT), psychodynamic therapy, Interpersonal Therapy (IPT) and Supportive Counselling as the main therapeutic approaches that deal with depression and anxiety symptoms in adults. In a similar administering technique, Pinquart [12] observed that administering psychotherapy to older people is quite effective as it promotes improvements in depression and increases general psychological well being as well as reducing depression in elders with mental disorders.

Brain imaging with Magnetic Resonance Imaging (MRI) or Computed Tomography (CT) is the technique often administered to patients with MCI. These techniques also help in tracking its progression towards Alzheimer's disease

and other types of dementia such as vascular dementia. However, there are no fixed or standardized neuropsychological tests for patients with MCI. Clinicians use the results from the standardized mental ability and cognitive tests to determine whether these data represent significant changes from a patients presumed baseline. Therefore, clinical testing has been required to determine whether the patients' cognitive functioning is improving or not. There are certain cognitive assessment tools that administered on MCI patients, such as, General Practitioner Assessment Of Cognition (GPCOG), Mini-Cog, and Memory Impairment Screen (MIS). Diagnosis of patients with MCI and heir monitoring is important.

Behaviour Management Therapy Techniques carry caregiver-training sessions to reduce the occurrence of behavioural symptoms and to modify the cause of patients' distress that impairs his routine work and activities [13]. Similarly, such other psychotherapies included are psychodynamic, interpersonal therapy and supportive psychotherapy. These primarily focused on to increase the psychological function and well-being of patients [14]. Apart from these, there are other types of intervention approaches that are used to target anxiety and depression in dementia-like reminiscence [15] and interventions pertaining to environmental process [16] or exercising [17].

1.2. Screening Measures to Assess Mild Cognitive Impairment

Clinical Dementia Rating (CDR) measures [18] are not only quite common in researches related to dementia have also been administered on MCI studies. It is termed as a gold standard measure in pharmacological studies of dementia medications. It is a semi-structured interview with the patient and informant that taps an overall level of impairment based on six cognitive categories: memory, orientation, judgment, problem-solving, community affairs, home, hobbies and personal care. The inclusion of such major categories is a time taking process. The second measure of the list in the queue is Functional Activities Questionnaire (FAQ) [19]. This is an observer-rated report in which a family member's ability is to perform a multitude of functions. This scale is usually administered in a concoction of other cognitive or screening measures while making an assessment for MCI or dementia.

To meet the purpose of medical diagnosis of geriatric patients, it is quite often that brief cognitive screening measures are administered to identify those who further need intensive neuropsychological testing. Several validated and common screening measures are designed to perform the tests. Montreal Cognitive Assessment (MoCA) is a well-established cognitive screen, highly sensitive to differentiating MCI from Dementia and normal cognition in multiple setting disorders and languages. The MoCA is better than MMSE [20] since this test overcomes the high-ceiling effect and educational bias. It has fewer practice effects and is available in multiple versions. The total administration time is around ten minutes. The MoCA is scored out of 30 points and has seven subtests covering five cognitive domains; visuospatial/ executive function, naming, memory, attention, language, abstraction, delayed recall and orientation. However, its subset scores are criticized for having low accuracy when predicting impairment in their respective cognitive domains. Its specificity cut-off (<26) is low, between 35% & 50%.

One of the traditional methods of diagnosing the MCI is the Mini-Mental Status Examination (MMSE). The MMSE was developed by psychiatrists and is highly being in use. It has some methodological issues and may discriminate positively for those with a higher level of educational attainment. There is no strong evidence in support of MMSE as a single-handed test for the identification of patients with a mild cognitive impairment who may develop dementia.

The Quick Mild Cognitive Impairment Screen (QMCi) is a short screening test for cognitive impairment that was developed as a rapid, valid, and reliable instrument for the early detection and differential diagnosis of MCI and dementia [21]. It consists of six subtests, covering five domains, orientation, registration, clock drawing, delayed recall and verbal fluency, such as the naming of animals within a span of one minute, and logical memory. Its total administration time is of around five minutes. The recommended cut-off score for cognitive impairment is <62.

The Seven Minute Screen [22] is a short compilation of cognitive tests *i.e.*, the temporal orientation test, enhanced cued recall, clock drawing and verbal fluency. In the temporal orientation, the orientation in time is measured and quantified in the degree of error. The maximum level of score is 113. In enhanced cue recall, the respondents have to identify 16 pictures, immediately after a brief interval. For each set of four pictures, semantic cues are given to them. The subjects are supposed to recall the four pictures at a time. After successful recalling, next set of pictures are presented. The total score is the number of pictures either remembered freely or after a cue is given. Clock drawing is the cognitive test where the subject has to draw the image of a clock and place the hands of the clock at a fixed time. The maximum score is 7 points. The subjects are supposed to name as many different animals as possible in one minute. The maximum score is 45. Mostly, there are specialist assessments and evaluations involve the presence of

specially trained neuropsychologist. Scales like the ACE-R (Addenbrooke's Cognitive Examination) that is a form of a brief cognitive test battery developed to measure rate level of dementia [23]. This measure is used frequently in clinical settings by clinicians. ACE-R is a brief battery that provides an evaluation of six cognitive domains *i.e.*, orientation, attention, memory, verbal fluency, language and visuospatial ability [24]. It is useful for detecting dementia and mild cognitive impairment.

2. DISCUSSION

It should be of concern while making screening test to assess the cognitive impairment of individuals that what is the level of severity. The diagnosis process of dementia and cognitive dysfunctioning should have the case history assessment of direct interviewing procedures. In order to meet the requirements, several screening measures and techniques have been developed as discussed earlier.

In borderline or mild cases of dementia, assessments need to be done to meet the criteria to diagnose the complicated cases in easy and accurate manners. Such assessments should not be only limited to the memory cases but also include the cases comprising of linguistic, motor and other cognitive abilities. In order to monitor progress over time, the Mini-Mental Stage Examination is the cognitive assessment instrument widely used for cognitive disturbances in patients. It consists of thirty items for gaining information based on orientation, attention, learning, calculation, delayed recall, and construction. Some other sets of generic measures commonly used for the assessment of overall severity of dementia are Clinical Dementia Rating (CDR) The Clinical Dementia Rating (CDR) is a universally applicable rating device. CDR scoring is estimated based on a semi-structured interview of the subject and the informant and on the clinical diagnosis made by the clinician. CDR is calculated by testing six different cognitive and behavioral domains such as memory, orientation, judgment and problem-solving community affairs, home and hobbies performance, and personal care. The CDR scale varies from 0–3, where each score denotes to “no dementia” (CDR = 0), “questionable dementia” (CDR = 0.5), “MCI” (CDR = 1), “moderate cognitive impairment” (CDR = 2), and “severe cognitive impairment” (CDR = 3). The Global Deterioration Scale (GDS) gives a brief overview of those suffering from primary degenerative dementia with respect to stages of cognitive function. These stages comprised of seven different levels. Stages 1-3 categorized as a pre-dementia stage; stages 4-7 are that of dementia stages; stages 5-7 represent an inability to survive without assistance [25].

Likewise, there is another common test measure to assess dementia called Bristol Activities of Daily Living Scale (BADLS). This is a questionnaire based on twenty items. This is meant to assess the level of dementia in cognitively impaired individuals and their ability to carry out activities of daily living, containing mostly self-help tasks, such as personal hygiene, preparing one's food, etc. The recent introduction of dementia-specific assessment scales for quality of life allows a significant step forward to measure the prevalence rate of mild cognitive impairment and the cognitive strength in affected population. Assessment of changes in behavioural and cognitive functions in dementia susceptible populations is especially important in evaluating treatment effects. In order to maximize the clinical practice, the clinical experts must consider using the mentioned instruments frequently for the effective administrative procedures. There is a great effort needed for choosing and justifying primary outcome measures in research trials and pre-intervention techniques. Thus, clarity about intervention effects is quite important and basic familiarity with the strengths and weaknesses of commonly used assessment scales in mild cognitive impairment and onset of dementia can help improve the complexities of clinical practice.

CONCLUSION

In spite of conducting frequent diagnosis of mild cognitive impairment in geriatric patients, certain disparities in its diagnosis and treatment procedures are reported [26]. Some of the observed errors may include such practices like having no consensus reports as a base to perform a certain number of neurological tests according to its need and suitability [27] or to mentioning the cutoff scores for each of the tests to indicate impairment [28].

Prevalence of MCI can be mitigated with the primary administration of intervention strategies and technology if the development of cognitive impairment in healthy people can be inhibited or stopped. The classifications and categorizations of MCI are getting broader and deeper day by day. The expansion in the use of imaging techniques and other neurological intervention strategies may further enhance the detection of subjects with MCI.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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