

Evaluation Of Cognitive Impairment

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Abstract

Mild cognitive impairment (MCI), a perceivable decrease in thought processes, primarily memory, occurs in individuals who are otherwise able to function in everyday activities. These patients have difficulty remembering the names of people, performing calculations, navigating in a mall parking lot, and keeping track of common objects. Various levels of self-awareness of these handicaps may exist, and complex systems of compensation can be constructed. MCI can affect a persons ability to work, to function independently, and perform activities of daily living (ADL), particularly if the loss progresses. Written testing and neurological evaluation are important methods of evaluation, and neuro-imaging has taken on a greater role in documenting the presence of MCI.

INTRODUCTION

Most (but not all) patients with Mild cognitive impairment (MCI) develop a progressive decline in their thinking abilities over time, and neurologic diseases are often the underlying cause. Occasionally, a patient may experience MCI as a result of toxin exposure in the workplace, trauma, prescription medication or reversible neurologic conditions such as NPH. This can lead to a claim for damages, and the presence, degree, and prognosis of the MCI can then become an important component of the litigation development.

The diagnosis of MCI relies on the fact that the individual is able to perform all their usual activities successfully, without more assistance from others than they previously needed. In this regard, MCI is different from dementia, where memory loss and at least one other cognitive deficit has progressed to such a point that normal independent function is impossible and the individual can no longer successfully manage their finances or provide for their own basic needs. Of interest, MCI may in some persons be a precursor to Alzheimer's disease (AD). Therefore, screening for MCI may be an important component of workup for early AD. MR Spectroscopy (MRS) is one methodology which has been shown to provide an objective means of screening for and quantifying neurodegenerative processes that can cause age-dependent cognitive deficits and which can eventually lead to AD and other dementias.

Common causes of MCI include:

- Multiple infarct dementia

- Cerebral Ischemia – stroke,
- Post-Trauma – concussion,
- Medication - interferon, SSRI, hypnotics; Ambien, NSAID, opioid analgesics, neuroleptic antipsychotics,
- Neurodegenerative illnesses - Alzheimer disease (AD) and other dementias,
- Hypoxic – decompression, post-resuscitation,
- Metabolic: hypothyroid, B12 deficiency
- Normal pressure hydrocephalus (NPH),
- Treatable intracranial masses – subdural hematoma (SDH),
- Imprisonment, torture, sensory deprivation, chronic pain
- Toxic chemical exposure
- Infections – HIV, Hepatitis C, neurosyphilis, Lyme disease
- Illicit drug use (metamphetamine, cocaine, THC),
- Inflammatory or immune diseases: SLE
- Chronic Illnesses – Chronic Fatigue Syndrome, major organ failure (heart, lung).

Exposure of a normal brain to a drug or toxin can result in MCI, of varying intensity and persistence. Most physicians are well-aware of the ability of chemical toxins, drugs, disease states and infections processes (some are listed above) to effect a patient's cognitive performance. Documenting this impairment is crucial!

MCI is typically subtle, but it is measurable. Patients have memory problems greater than normally expected for their age, but do not show other symptoms of dementia, such as impaired judgment or reasoning. The injury is thought to arise mostly in the medial temporal lobe, including the hippocampus, but can also be widespread, involving a large portion of the neocortex and subcortical white matter. The indicated evaluation of MCI includes a comprehension neurologic examination, neuropsychological evaluation including formal neurologicpsychologic testing, electrophysiologic tests when indicated, serologic and CFS tests (as indicated), and specialty neuroimaging tests. The less subjective, and the more quantifiable, the better.

EVALUATION OF COGNITIVE IMPAIRMENT

There are a number of reasons why one needs to measure the degree of cognitive impairment. These include quantifying the current state, documenting the degree of ongoing loss, demonstrating the degree of physical or mental impairment, and developing a treatment plan and giving a prognosis. The principle areas of MCI documentation and workup are discussed above.

- Comprehensive neurological exam,
- The neuro-psychiatric interview should always be performed by experienced professionals,
- Written Neuro-psychiatric Evaluation Tools – These are standard, and of relatively good quality, but certainly have the possibility of being manipulated by the examinee.
 - Mini Mental Status Exam
 - Mattis Dementia Rating scale
 - Mindstreams™ (NeuroTrax Corp., NY)
 - ADAS-cog
 - Depression Scale (such as Beck)
- MRI – provides structural information on the brain, and can be used to rule out alternative etiologies.

Changes associated with MCI which have been reported with MRI include:

- Hyperintense lesions in the periventricular white matter and centrum semiovale on T2-weighted images.
 - These lesions tend to be patchy in the early stages and diffuse as the disease progresses
 - The differential diagnosis includes multiple sclerosis (MS) and small-vessel disease.
 - MR Spectroscopy – identifies abnormal areas of neuron function, and can make a correlation to functional deficits in MCI.
 - MRS can analyze for a number of specific chemicals, including N-acetylaspartate (NAA), a brain metabolite localized almost exclusively to neurons and neuronal processes in the human adult brain
 - MRS measures changes in the signal intensity of NAA, which correlates with brain damage
 - Can actually quantify neuronal-axonal injury and loss. The final product is an actual picture of the damage, a visual representation.
 - Functional MR Imaging – used to provide an objective measurement of a perceived deficit. A stimulus or task is presented during the actual MR imaging process, and functional brain activity is monitored.
 - Electrophysiologic testing, including EEG.
 - Serologic and CSF testing, as indicated.
- Issues in demonstrating MCI include establishing the pre-morbid state of cognition, determining the presence of mental decline, and linking the mental decline to its cause. It may be difficult to establish that a normal baseline existed, as injured individuals did not plan on an injury occurring, and did not take a convenient snapshot of brain function at various normal points in their lives. An estimate of cognitive

function can be reconstructed, though, by an independent objective analysis of a person's job and school performance, samples of their writing, interviews with family and coworkers, and other forms of scrutiny of their lives pre-MCI.

Utilizing a unified team to definitely evaluate a patient with failing mental function would be ideal. The performing center(s) must be experienced in specialized MR imaging (including MRS and functional MRI), and be proficient in neurocognitive testing and neurologic evaluation. The evaluating center should utilize an experienced team of professionals able to develop a report directed to satisfying the principles of scientific evidence.

CONCLUSIONS

A practical clinical program when implemented can determine with a high degree of medical probability whether a patient is experiencing Cognitive Impairment, to what degree, and from what likely causes. Such an evaluation must depend on valid scientific principles, backed by studies published in peer-reviewed journals.

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