Abstract

Objective: Reliable tests for mild cognitive impairment (MCI) are extremely clinically valuable. No MCI screening tests exist for those with hearing impairment. Our objective is to validate a modified version of the Montreal Cognitive Assessment (MoCA) for use in patients with hearing impairment (MoCA-H).

Methods: Older-aged subjects were recruited from outpatient Otolaryngology clinics. A battery of cognitive screening tools and the MoCA-H were administered to 62 normal hearing subjects and subjects with severe-to-profound hearing loss (HL). The MoCA was restested 6 months after MoCA-H was administered in a subset of subjects.

Results: No significant difference was demonstrated between the MoCA-H scores in those with and without HL. Similar scores were noted between the MoCA-H and MoCA in a subset.

Conclusion: The MoCA-H results of normal cognitively screen subjects have a high correlation to MoCA results. The MoCA-H would be an invaluable tool to detect MCI in those with hearing impairment.

Introduction

With the aging of our population and increasing average lifespan, we are increasingly encountering patients with mild cognitive impairment (MCI) (1). MCI is an intermediate stage on the spectrum of cognitive function between normal cognitive decline of normal age and more serious decline of dementia (2). Patients may notice problems with memory, language, thinking and judgment. Dementia is a public concern and experts have predicted the number of those affected to double every 20 years (1). It has been estimated 81.1 million people will be affected by dementia by 2040. MCI may increase the risk of progression to Alzheimer’s dementia or other neurological conditions (3). Early detection and treatment of MCI and dementia is beneficial and has a role slowing the progression of the disease process (4).

Screening for MCI is performed by a primary care physician or Neurologist. Common screening tools include the Montreal Cognitive Assessment (5) and the Folstein Mini Mental Status test (6). The Montreal Cognitive Assessment is a validated screening tool developed in 2003. It has been adapted and validated in multiple languages and used worldwide. These commonly utilized validated screening tools for cognitive testing are excellent at detecting patients presenting with early cognitive decline. These tests, however, rely on the patient’s ability to follow auditory instructions. No clinical screening test for MCI is available for patients with severe hearing loss. Our objective is to validate a modified version of the Montreal Cognitive Assessment (MoCA) for use in patients with hearing impairment (MoCA-H).

Methods

The Montreal Cognitive Assessment was adapted to a visual slideshow presentation called the Modified MoCA (MoCA-H). Verbal instructions were translated into digital, visual instruction. All domains of the MoCA were translated and were reviewed by two Neurologists. The test was scored out of 30, similar to the MoCA. Older-aged (>60 years of age) subjects were recruited from outpatient Otolaryngology clinics and consent was obtained. Group #1 included those fluent in English, had at least a Grade 6 education and had no evidence of hearing impairment. Subjects were excluded for a personal or family history of dementia, if they had taken a cognitive assessment within 6 months, or had a history of hearing loss. These subjects took a battery of cognitive screening tools. Subjects who passed the screen were then administered the MoCA-H. Group #2 had similar inclusion criteria to Group #1 but also had severe-to-profound hearing loss on audiometry. The MoCA-H was performed on 62 normal hearing subjects and 50 subjects with HL. The regular MoCa was restested 6 months after MoCA-H was administered on a subset of Group #1.

Results

62 subjects were tested in Group #1. 7 were excluded, 4 due to frustration and 3 due to a neurological disorder or family history of dementia. The average age was 70.9. The average score of patients who underwent the MoCA-H was 26.6 (SD = 2.04), consistent with the accepted normal cutoff of >26/30. Group #2 consisted of 41 cochlear implant subjects. 1 was excluded due to frustration. The average age was 71.8. No significant difference was demonstrated between the MoCA-H scores in those with and without HL of those 8 restested (p>0.01). Similar scores were noted between the MoCA-H and MoCA in the subset of normal hearing subjects that were restested (p>0.01). Further subanalysis of test categories revealed small differences between the MoCA-H and MoCA. Domains differing between the MoCA-H and MoCA included “Trails”, “Naming”, and “Memory”.

Discussion

Results confirm a trend showing the MoCA-H is normal in the normal cognitive population. The MoCA-H is easily administered to patients with hearing impairment. Scoring is similar to the original, validated MoCA test. Our results show patients with normal hearing performed better on certain testing domains than subjects with significant hearing impairment. Differences in certain domains are best explained by differences between the relationship of hearing and short-term memory and the relationship between visualization and short-term memory neural pathways. Studies have shown that auditory directions are more accurately recalled in the short term memory setting compared recall based on visual input alone (7). This suggests a possible need for an “auditory adjustment factor” to requirement normalize scores of the MoCA-H.

Conclusion

The MoCA-H results of normal cognitively screen subjects have a high correlation to MoCA results. The MoCA-H is the only tool to detect MCI in patients with hearing impairment. This will lead to early detection and treatment of MCI in the hearing-impaired elderly.