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Screening for Cognitive Impairment in Multiple Sclerosis with MOCA Test

Multipl Sklerozda Bilişsel Etkilenmenin MOBİD Ölçeği ile Taranması

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Summary

Objective: Currently cognitive dysfunction is recognized as a significant cause of disability in multiple sclerosis (MS). The Montreal Cognitive Assessment (MOCA) test is a screening device used to evaluate executive functions, visuo-spatial abilities, language, attention, and concentration, abstract thinking, memory, and orientation domains. The aim of this study is to compare cognitive functions of MS patients with age-matched controls using MOCA test.

Material and Method: Thirty-nine subjects with a diagnosis of relapsing-remitting MS based on the 2010 revised McDonald criteria and 20 healthy volunteer controls participated in this study. Patients and controls were administered the Turkish version of MOCA test. Total and subgroup scores were compared.

Results: Total MOCA score in MS patients and controls were 21.74±4.48 and 26.9±2.53, respectively. Total MOCA score of MS patients was significantly lower than controls (p=0.000). Significant deterioration was also found in language, attention, memory and executive functions domains. Disease duration and expanded disability status scale (EDSS) did not differ in patients with and without cognitive deficits.

Discussion: Patients with MS showed deterioration in language, attention, working and long term-memory and executive functions compared to controls. MOCA is a simple, stand-alone cognitive screening test with superior sensitivity. Our findings suggest that the MOCA test may be useful for screening cognitive impairment in MS patients early in the disease course. *(Turkish Journal of Neurology 2013; 19:52-5)*

Key Words: Multiple sclerosis, cognitive impairement, MOCA test

Özet

Amaç: Bilişsel bozukluk multipl sklerozda (MS) özürlülüğün önemli nedenlerinden biridir. Montreal Bilişsel Değerlendirme Ölçeği (MOBİD) yürütücü işlevler, görsel-mekansal beceriler, dil, dikkat ve konsantrasyon, soyut düşünme, bellek ve oryantasyondan oluşan farklı bilişsel alanları değerlendiren bir tarama testidir. Bu çalışmanın amacı MS'li hastaların bilişsel işlevlerini benzer yaş grubundaki kontroller ile MOBİD ölçeği kullanarak karşılaştırmaktır.

Gereç ve Yöntem: Çalışmaya Ekim ve Aralık 2011 arasında ardışık olarak Şişli Etfal Eğitim ve Araştırma Hastanesi Demiyelinizan Hastalıklar Polikliniği'ne başvuran, gözden geçirilmiş McDonald 2010 kriterlerine göre MS tanısı konmuş, relapsing remitting MS seyir tipinde toplam 39 hasta ve 20 benzer yaş ve cinsiyet dağılımında sağlıklı gönüllü dahil edildi. Hasta ve kontrollere Türkçe'ye çevrilmiş MOBİD ölçeği uygulandı. Toplam ve alt grup skorları karşılaştırıldı.

Bulgular: Toplam MOBİD skoru hasta ve kontrollerde sırası ile 21,74±4,48 ve 26,9±2,53 idi. Toplam MOBİD skoru MS hastalarında kontrollere göre anlamlı derecede düşük bulundu (p=0,000). Ayrıca dil, dikkat, bellek ve yürütücü işlevler alanlarında da belirgin bozulma saptandı. Bilişsel bozukluğu olan ve olmayan hastaların hastalık süresi ve expanded disability status scale (EDSS) skoru arasında fark bulunmadı.

Sonuç: MS hastalarında dil, dikkat, bellek ve yürütücü işlevler alanlarında saptanan bilişsel bozukluk kontrol grubundan anlamlı farklı bulunmuştur. MOBİD bilişsel etkilenmenin erken evresinde kullanılan bir tarama testidir. Bulgularımız MOBİD ölçeğinin MS hastalarında da tarama amaçlı kullanılabileceğini desteklemektedir. *(Türk Nöroloji Dergisi 2013; 19:52-5)*

Anahtar Kelimeler: Multipl skleroz, bilişsel bozukluk, MOBİD ölçeği

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Introduction

Multiple sclerosis (MS) is the most significant demyelinating disease of the central nervous system, mainly affecting young adults (1). One of the most important causes of disability in MS is cognitive impairment besides motor, sensorial, visual and cerebellar involvement. The prevalence of cognitive disorders is between 40% and 70% in both the early and late stages of the disease (1,2,3). Most commonly affected cognitive areas in MS are attention, executive functions, rate of information processing and memory (2,4,5). Cognitive impairment is seen from the early stages of MS and has a negative effect on activities of daily living. Therefore, early recognition of cognitive involvement carries utmost importance. Although the number of instruments evaluating cognitive performance has increased, there is no consensus on a widely accepted screening test to be used in daily practice (1).

The Montreal Cognitive Assessment (MoCA) Scale evaluates various cognitive dimensions including attention and concentration, executive functions, memory, language, visual – spatial abilities, abstract thinking, calculating and orientation (6). MoCA is particularly useful in early stages of cognitive involvement (7) and may be an easily administered suitable screening test in MS patients as cognitive involvement may be indistinct.

The purpose of this study is to compare the cognitive functions of MS patients with those of age-matched controls using the MoCA scale.

Material and Method

A total of consecutive 39 patients diagnosed with relapsing – remitting MS based on the revised McDonald 2010 criteria and 20 age- and sex-matched healthy volunteer controls were enrolled in the study between October and December 2011 in Sisli Etfal Training and Research Hospital Demyelinating Diseases Outpatient Clinic. All patients and healthy controls provided informed consent. Subjects who were illiterate, who had an attack within 1 month prior to screening and who were taking steroids were excluded from the study. Demographic data, education and disease duration, concomitant treatments of subjects were recorded. Neurological disabilities were evaluated using the Expanded Disability Status Scale (EDSS).

All patients and controls were administered the MoCA scale in Turkish. MoCA scale includes the following tasks: memory tasks, including recall from short term memory, attempts to learn five words (twice) and delayed remembering after five minutes (5 points); tasks requiring visual – spatial abilities, including clock drawing test (3 points) and copying a 3 dimensional cube (1 point); tasks of executive function, trail making test – consecutive digit and letter patterns (e.g. 1-A, 2-B, 3-C) (1 point); verbal fluency (1 point) and two item abstract thinking task (2 points); tasks of attention, concentration and working memory, serial subtraction (3 points) and counting forward and backward (1 point each); language tasks, naming pictures of relatively less known 3 animals (lion, rhinoceros, camel) (3 points), repeating two complex sentences in the same syntax (2 points) and finally, temporal and spatial orientation (6 points). The lowest possible score in the scale is 0 and the highest possible score is 30. Total and sub group MoCA scores of patients and controls were compared. Cognitive impairment diagnosis cutoff was established as a MoCA score of below 21 points (6).

Statistical analysis of the data obtained in the study was performed using SPSS 16.0 software. Comparisons of group means were made using student t-test and chi-square test. Independent factors affecting the presence of cognitive dysfunction in MS patients were evaluated with logistic regression analysis. Statistical significance was set at $p<0.05$.

Results

The mean age of patients and control enrolled in the study was 36.15±9.32 and 32.5±8.13, respectively (p=0.14). Twenty-five of the patients (64%) and 14 of the controls (70%) were women (p=0.65). MoCA test results of the patients and controls are shown in Table 1. Total MoCA scores of the MS patients were significantly lower than those of the control subjects (p=0.000). In addition, there was clear impairment in domains of language, attention, memory and executive functions. While the counting forward and backword, a working memory task that shows the rate of information processing was impaired in 11 of MS patients, it was impaired in only 1 control subject (p=0.03). On the other hand, in the domain of verbal fluency, while MS patients could name 8.41±3.31 words beginning with the letter "k", this value was found to be 13.5±4.82 in the control subjects (p=0.001). Demographic characteristics of patients with and without cognitive impairment are shown in Table 2. The age of patients with cognitive dysfunction was significantly higher than those without dysfunction (p=0.01). In addition, the duration of education of patients with cognitive dysfunction was significantly less than those without dysfunction (p=0.000). There was no difference between the two groups for disease duration, disability status and treatment administration. When factors thought to affect cognitive dysfunction in MS patients were evaluated using logistic regression analysis, age and education duration were found to be independent factors affecting cognitive dysfunction (Table 3).

Table 1. MoCA test scores of patients and control group

	MS patients n=39	Controls n=20	P value
Education duration (years)	8.58±4.45	9.15±4.1	0.64
Total MoCA score	21.74±4.48	26.9±2.53	0.000
Visual-spatial ability	3.25±1.06	3.4±0.68	0.58
Executive functions	2.43±1.23	3.55±0.68	0.000
Attention	4.53±1.57	5.7±0.73	0.003
Language	3.23±1.03	4.2±1.05	0.001
Close memory	2.43±1.51	4.1±0.96	0.000
Orientation	5.87±0.33	6±0.00	0.09

Table 2. Demographic characteristics of patients with and without cognitive impairment

	MS patients Cognitive impairment (+) n=17	MS patients Cognitive impairment (-) n=22	P value
Age	41.41±7.86	32.09±8.39	0.01
Sex (female)	10	15	0.42
Education duration (years)	5.47±2.03	11.0±4.34	0.000
Disease duration	7.8±6.02	5.0±5.03	0.11
EDSS	1.23±1.79	0.86±1.42	0.47
Immunomodulatory treatment (+)	10	14	0.75

Table 3. Logistic regression analysis for factors affecting cognitive dysfunction in MS patients

			95% CI	
	p	OR	Minimum	Maximum
Age (years)	0.023	1.474	1.054	2.061
Education duration (years)	0.044	0.232	0.056	0.958
Sex	0.220	5.80	0.350	96.149
Disease duration (years)	0.601	1.067	0.836	1.362

CI: Confidence interval; OR: odds ratio

Discussion

We found a significance difference between MS patients and the control group for the dysfunction in language, attention, memory and executive functions domains. When patients with and without cognitive impairment were compared, although there was no difference between the two groups for disease duration, EDSS and immunemodulatory treatment, it was shown that cognitive impairment was significantly higher in advanced age and lower educational levels.

The results of studies showing the relation between cognitive impairment and duration of disease and type of disease and degree of disability have been conflicting. Numerous cross sectional studies have concluded that physical disability measured with EDSS and disease duration are not good indications in showing the degree of cognitive involvement (8). This was explained with the variability in the course of disease and localization of lesions (9). In fact, we did not find any difference in disease duration and physical disability in patients with cognitive impairment. Despite this, it is thought that cognitive involvement increases with the progression of physical disability and the course of the disease (8).

Immunomodulatory therapy (IMT) is increasingly used in MS in the last decade. Although these treatments have been shown to decrease the number of attacks and development of new lesions in MS, their effect on cognitive symptoms are not yet clear (10,11). Some studies have shown the positive effects of IMT on cognitive involvement (12,13,14). Our study limits a definitive conclusion due to the low number of patients and cross sectional design.

Cognitive involvement in MS is specific to a region rather than a global decline (1). It can be indistinct in the early stages of the disease and there is great variability between patients (1). While learning and memory, attention, rate of information processing and executive functions are commonly affected in MS, language disorders are rarely seen (1,3,8). This is explained by widespread white matter involvement and relative protection of grey matter (1,8). In our study, we found that MS patients had both naming and repeating functions were more impaired than those of controls. We observed that rhinoceros, one of the 3 animals used in naming in the Turkish version of the MoCA scale, could not be named by especially lower education level individuals. However, when we only reviewed naming of rhinoceros, there was significant difference between the patient group and the control group. The patients were generally observed to say "cats" instead of "cat" in the sentence "The cat always hid under the couch when dogs were in the room" used as the repetition sentence in the Turkish version of the MoCA scale. This was thought to arise from difference of syntax between Turkish and English. Again, despite this, repetition for patients was found to be significantly more impaired than in control subjects. MRI techniques developed in recent years have shown that cortical grey matter in MS is involved from early stages of the disease (8,9,10,11,12,13,14,15). Neuron loss in the temporal and frontal cortical grey matter and reginal atrophy is responsible for the cognitive involvement (8).

MoCA scale evaluates in detail the most commonly affected domains in MS, namely memory, attention, executive functions and rate of information processing. Our findings of the performance of MS patients being more impaired than that of controls suggests that the MoCA scale may be used in daily practice for screening.

In conclusion, cognitive disorder is commonly seen in MS and negatively affects the quality of life of patients. In addition, cognitive impairment has an economic burden and is a leading cause of physical disability and unemployment for MS patients even after adjusting for disease duration. Therefore, early recognition and early treatment is of utmost importance.

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