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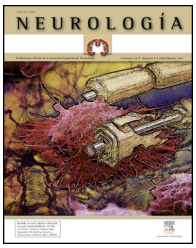

ORIGINAL ARTICLE

Correlation between demyelinating lesions and executive function decline in a sample of Mexican patients with multiple sclerosis☆

V.R. Aldrete Cortez[a,*], E. Duriez-Sotelo[b], P. Carrillo-Mora[c], J.A. Pérez-Zuno[b]

[a] *Departamento de Neurología del desarrollo, Instituto Nacional de Perinatología Montes Urales 800, Col Virreyes, Delegación Miguel Hidalgo, México, DF, Mexico*
[b] *Departamento de Neurología, Hospital CIMA, San Pedro Garza García, Nuevo León, México, Mexico*
[c] *Servicio de Rehabilitación Neurológica, Instituto Nacional de Rehabilitación, Calz. México-Xochimilco, México, DF, Mexico*

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Abstract
Background: Multiple sclerosis (MS) is characterised by several neurological symptoms including cognitive impairment, which has recently been the subject of considerable study. At present, evidence pointing to a correlation between lesion characteristics and specific cognitive impairment is not conclusive.
Objective: To investigate the presence of a correlation between the characteristics of demyelinating lesions and performance of basic executive functions in a sample of MS patients.
Material and methods: We included 21 adult patients with scores of 0 to 5 on the Kurtzke scale and no exacerbations of the disease in at least 3 months prior to the evaluation date. They completed the Stroop test and the Wisconsin Card Sorting Test (WCST). The location of the lesions was determined using magnetic resonance imaging (MRI) performed by a blinded expert in neuroimaging.
Results: Demyelinating lesions were more frequently located in the frontal and occipital lobes. The Stroop test showed that as cognitive demand increased on each of the sections in the test, reaction time and number of errors increased. On the WCST, 33.33% of patients registered as having moderate cognitive impairment. No correlation could be found between demyelinating lesion characteristics (location, size, and number) and patients' scores on the tests.
Conclusion: Explanations of the causes of cognitive impairment in MS should examine a variety of biological, psychological, and social factors instead of focusing solely on demyelinating lesions.

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* Corresponding author.
E-mail address: valdrete@gmail.com (V.R. Aldrete Cortez).

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PALABRAS CLAVE
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Neuropsicología;
México

Correlación entre las lesiones desmielinizantes y el deterioro de las funciones ejecutivas en una muestra de pacientes mexicanos con esclerosis múltiple

Resumen
Antecedentes: La Esclerosis Múltiple (EM) se caracteriza por una gran diversidad de síntomas neurológicos de entre los cuales el deterioro cognitivo recientemente ha cobrado una especial relevancia. Hasta el momento la evidencia acerca de una correlación entre las características de las lesiones y el deterioro cognitivo específico aún no es concluyente.
Objetivo: Analizar si existe una correlación entre las características de las lesiones desmielinizantes y el desempeño de las funciones ejecutivas básicas en estos pacientes.
Pacientes y Métodos: Se incluyeron 21 pacientes adultos con puntaje de 0-5 en la escala de Kurtzke, sin exacerbaciones de la enfermedad en los 3 meses previos a la evaluación. Se les aplicaron las pruebas de Stroop, y el Wisconsin Card Sorting Test (WCST). La localización de las lesiones fue determinada por Resonancia Magnética por un observador experto y cegado
Resultados: Las lesiones desmielinizantes se distribuyeron con mayor frecuencia en los lóbulos occipitales y frontales. En el Stroop se observó que, a medida que se incrementa la demanda cognitiva en cada sección de la prueba, aumentan el tiempo de reacción y el número de errores. En el WCST, un 33.33% presentó un deterioro medio a moderado. No se encontró una relación entre la lesiones desmielinizantes — localización, tamaño y suma total — y los puntajes de las pruebas aplicadas.
Conclusión: En la explicación del deterioro cognitivo en la EM, se deben considerar no sólo a las lesiones desmielinizantes sino también otros factores biológicos, psicológicos y sociales.

Introduction

Multiple sclerosis is a chronic demyelinating autoimmune disease of the central nervous system (CNS) characterised by the relapsing appearance of multiple demyelinating lesions in the white matter. Lesions show mild axonal damage at onset and severe damage in advanced stages of the disease.[1,2] MS is clinically characterised by episodes of very diverse types of neurological dysfunction, including motor, sensory, visual, cerebellar, and other deficits.[2] Among its many clinical manifestations, cognitive and psychiatric symptoms have recently attracted attention due to their involvement in the disability associated with this disease.[3,4]

Studies indicate that between 40% and 65% of patients with MS experience neuropsychological alterations.[5] Changes are considered to be severe in 6% to 10% of all cases, and contribute significantly to patients' levels of disability.[6] Although neuropsychological alterations are more common in the later stages of secondary progressive MS, researchers have also described cognitive impairment in early stages of relapsing MS.[4,7] The most frequently affected cognitive functions in this disease are attention, long-term memory, verbal information processing speed, and executive functions (EF).[1,5]

It is especially interesting to analyse EF performance, since EFs are tertiary cognitive processes that regulate the more basic cognitive functions involved in patients' activities of daily life. These processes are often impaired in patients with MS.[8,9] Some authors have even stated that inhibition is perhaps the most frequently altered function in these patients.[10] Defining the cognitive processes involved in EFs is a theoretical problem, since EF is usually understood as an umbrella category including all higher-level processes. On the other hand, authors such as Miyake et al. propose a model in which EF has 3 main components: inhibition, flexibility, and working memory.[11] The inhibition of prevailing responses or irrelevant stimuli has been widely and effectively examined using the Stroop test.[12] In addition, the Wisconsin Card Sorting Test (WCST) is considered a useful tool for assessing cognitive flexibility.[8,11] Working memory may also be analysed by using modified versions of the Stroop Test requiring temporary retention of information. We therefore propose this brief evaluation with the aim of assessing basic EF performance.

Researchers have previously attempted to correlate cognitive deterioration in MS patients with such different clinical variables as progression timeline, educational level, age, sex, depressive symptoms, etc. However, many authors found no significant relationships.[13–16] At the same time, other studies have searched for a link between neuropsychological deterioration and different characteristics of demyelinating lesions including location, size, number of lesions, and total lesion area, but no conclusive results have been found to date.[17,18] Identifying any correlations between the location of demyelinating lesions and the neuropsychological deterioration of specific processes (such as basic EFs) will enable us to predict the clinical behaviour of MS patients. This will help researchers establish cognitive rehabilitation measures designed to reduce the disability stemming from this process.

Patients and methods

Patients

We included 21 patients from Hospital CIMA (Monterrey, Nuevo León, Mexico) with a definitive diagnosis of relapsing remitting MS according to the revised McDonald criteria[19]; patients were recruited consecutively. Included patients