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ORIGINAL ARTICLE/ARTICLE ORIGINAL

Walking while talking in patients with multiple sclerosis: The impact of specific cognitive loads

Marcher en parlant chez des patients avec une sclérose en plaques : l'impact de différentes charges cognitives

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Gait disorders;
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Summary
Objectives. — Gait and cognitive disorders are frequently reported in patients with multiple sclerosis, leading to decreased quality of live. The objective of this prospective study was to examine the impact of four specific cognitive tasks on gait in patients with relapsing—remitting multiple sclerosis (RRMS) with low disability.
Methods. — The mean ± standard deviation (SD) of walking speed, stride time and stride length were measured in 25 patients with RRMS (age: 39.46 ± 8.32 years; Expanded Disability Status Scale [EDSS] score: 1.90 ± 1.01; disease duration: 5.62 ± 5.12 years) and in 25 age-matched controls. Gait was assessed during single task and while doing four different cognitive tasks (forward counting, backward counting, semantic verbal fluency, phonemic verbal fluency). Spatiotemporal gait parameters were recorded by a 12-camera optoelectronic system.
Results. — Patients walked slower and with a decrease stride length during the single task and the four dual tasks than controls, except for the condition of backward counting. RRMS patients and controls presented the same cognitive performances for the four conditions during walking. EDSS score was correlated with gait speed and stride length in single task, and in the dual tasks of the backward counting and phonemic fluency.

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Conclusion. — Quantitative gait assessment reveals subtle gait disorders in patients with low disability of relapsing—remitting multiple sclerosis. The impact of different cognitive domains on gait induces specific gait disturbances that highlight the strong interaction between gait and cognition.

MOTS CLÉS
Troubles de la marche ;
Double tâche ;
Sclérose en plaques ;
Neuropsychologie

Résumé
Objectif. — Les troubles de la marche et des fonctions cognitives sont fréquemment décrits dans la sclérose en plaques, mais ne sont souvent pas ou tardivement mis en évidence. L'objectif de cette étude prospective était d'examiner l'impact de quatre tâches cognitives sur la marche de patients souffrant d'une sclérose en plaques de forme poussées-rémissions (RRMS) avec un faible handicap.
Méthode. — La valeur moyenne et l'écart-type de la vitesse de marche, du temps du cycle et de la longueur du cycle de marche ont été mesurés chez 25 patients avec une sclérose en plaques de forme RRMS (âge : 39,46 ± 8,32 ans ; Expanded Disability Status Scale (EDSS) score : 1,90 ± 1,01 ; durée de la maladie : 5,62 ± 5,12 années) et chez 25 sujets sains appariés sur l'âge. La marche a été évaluée en condition de simple tâche et durant la réalisation de quatre tâches cognitives (comptage endroit, comptage envers, fluence verbale sémantique, fluence verbale phonémique). Les paramètres spatio-temporels de la marche ont été mesurés avec un système optoélectronique de 12 caméras.
Résultats. — Les patients ont marché avec une vitesse réduite et une longueur du cycle de marche diminuée en condition de marche seule et durant les quatre doubles tâches par rapport aux contrôles, hormis lors de la tâche de comptage envers où la vitesse de marche était similaire dans les deux groupes. Les patients ainsi que les sujets sains ont présenté des performances cognitives identiques durant les quatre doubles tâches. L'EDSS était associé avec la vitesse de marche et la longueur du cycle de marche en condition de simple tâche et lors des doubles tâches de comptage envers et de fluence verbale phonémique.
Conclusion. — L'évaluation quantitative de la marche révèle des troubles de la marche discrets chez des patients RRMS avec un faible handicap. L'impact de différents domaines cognitifs sur la marche induit des troubles spécifiques de la marche, ce qui met en évidence le lien étroit qui existe entre marche et cognition.

Introduction

Multiple sclerosis (MS) is a chronic inflammatory demyelinating disease of the central nervous system leading progressively to a decline of gait and cognitive performance in young adults [9]. Although gait disorders are frequently not detected at the disease onset, more than 85% of MS patients report some walking difficulties [5]. Difficulties to detect early gait disorders in MS include time required, complexity of the exams, cost, and lack of specialized resources. In addition, the current availability of symptomatic drugs to improve walking (4-aminopyridine) increases the need of new sensitive methods better than the simple use of stopwatch.

Subtle gait changes can be assessed by the monitoring of the dual-task paradigm. This paradigm consists to evaluate the subject when he performs an attention-demanding task while walking and to observe any walking modifications compared with the reference task, i.e., usual walking [13]. Modifications are interpreted as the involvement of attention while walking and attest of the non-automatic level of gait control. For example, in early demented patients, we showed that demented patients with impaired executive functions modified significantly their gait parameters while dual tasking compared to demented patients without executive dysfunction and to non-demented subjects [2]. Furthermore, we showed in a previous report that dual-task related gait changes were related to the attentional load of the cognitive task [1]. The use of dual task was recently shown in MS [10,17] and in patients with clinically isolated syndrome (CIS) suggestive of MS [10]. These previous studies highlighted the effects of the cognitive deficits of MS patients on gait. Due to the various cognitive deficits in patients with MS, it would be interesting to study the effect of cognitive tasks from different cognitive domains on gait.

Acquiring more information about different cognitive loads on gait in RRMS patients with low disability, may help better understanding gait disorders in this condition. Our aim was to assess and compare the effects of four cognitive tasks (forward counting, backward counting, semantic fluency, phonemic fluency) on gait speed, stride time and stride length, between RRMS patients and healthy controls.

Method

Participants

Twenty-five outpatients with RRMS (age: 39.46 ± 8.32 years; Expanded Disability Status Scale (EDSS) score: 1.90 ± 1.01) from the department of neurology of the Geneva university hospitals diagnosed according to the revised Mc Donald