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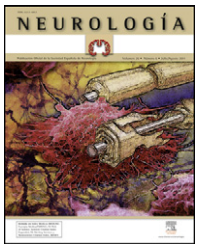

ORIGINAL ARTICLE

Effects of vibrotherapy on postural control, functionality and fatigue in multiple sclerosis patients: A randomised clinical trial☆

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KEYWORDS
Balance;
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Abstract
Introduction: Postural and balance disorders, functionality impairment and fatigue, are the most incapacitating problems in multiple sclerosis (MS) patients. Whole Body Vibration (WBV), through the transmission of mechanical stimuli, appears to be a useful therapeutic tool in the treatment of neurological diseases. The objective of this study is to assess the effect of the WBV on postural control, balance, functionality and fatigue in patients with MS.
Material and methods: A total of 34 patients with mild—moderate MS were randomised into a control group and an intervention group. For the intervention group, the protocol consisted of 5 consecutive days, daily series of 5 periods of 1 min duration of WBV at a frequency of 6 Hz. Posturographic assessment using the sensory organisation test (SOT) and motor control test (MCT), the timed get up and go test, 10 m test, the Berg balance scale and Krupp's fatigue severity scale were used before and after intervention.
Results: The analysis showed improvements in the intervention group for conditions SOT 1, SOT 3 and latency in MCT. In the comparison between groups, only the latency or reaction time in MCT improved significantly in favour of the intervention group (from 173.78 ± 12.46 to 161.25 ± 13.64 ms; $P = .04$). No side-effects were found.
Conclusions: The results of this pilot study show that WBV can improve, in the short-term, the time of response to recover the uprightness after sudden disturbances, appearing as a possible therapeutic tool maintaining balance and posture.

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PALABRAS CLAVE
Control postural;
Esclerosis múltiple;
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Vibroterapia

Efectos de la vibroterapia sobre el control postural, la funcionalidad y la fatiga en pacientes con esclerosis múltiple. Ensayo clínico aleatorizado

Resumen
Introducción: Los trastornos del equilibrio, junto con las alteraciones de la funcionalidad y la fatiga, constituyen los síntomas más incapacitantes en los pacientes con esclerosis múltiple (EM). La vibroterapia de cuerpo entero o *whole body vibration* (WBV), a través de la transmisión de estímulos mecánicos, se presenta como una herramienta terapéutica útil en el tratamiento de las alteraciones del control postural en diversas patologías neurológicas. El objetivo del presente estudio es valorar el efecto a corto plazo de la vibroterapia sobre el control postural, la funcionalidad y la fatiga en pacientes con EM.
Material y métodos: Treinta y cuatro pacientes con EM con afectación leve-moderada, distribuidos aleatoriamente en un grupo control y un grupo experimental, participaron en el estudio. El grupo experimental fue sometido a WBV durante 5 días consecutivos (series diarias de 5 periodos de 1 min de duración) a una frecuencia de 6 Hz. Previamente y post-intervención, fueron realizadas valoraciones con posturografía dinámica computarizada, mediante el test de organización sensorial (SOT) y el test de control motor (MCT), así como con el test *timed up and go*, la escala de equilibrio de Berg, la prueba los 10 metros y la escala de severidad de fatiga de Krupp.
Resultados: El análisis comparativo de datos pre y post-intervención de los grupos mostró mejoras en el grupo experimental para las condiciones SOT 1, SOT 3 y la latencia en el MCT. Realizada la comparación entre grupos, únicamente la latencia o tiempo de reacción en el MCT mejoró significativamente a favor del grupo experimental (de $173{,}78 \pm 12{,}46$ a $161{,}25 \pm 13{,}64$ ms; $p = 0{,}04$). No se registraron efectos adversos derivados.
Conclusiones: Los resultados de este estudio muestran que el protocolo utilizado de WBV mejoró a corto plazo el tiempo de respuesta para recobrar la verticalidad ante estímulos desestabilizantes, pudiéndose mostrar como una opción terapéutica en el mantenimiento del control postural y el equilibrio en pacientes con EM.

Introduction

Multiple sclerosis (MS) is a major cause of disability and the most common neurological disease in young adults. It has been over 140 years since the clinical and pathological features of MS were first described and yet its aetiopathogenic knowledge remains a challenge.[1] Its course is progressive, varied and unpredictable, leading to a physical and cognitive deterioration of patients. At present there is no effective treatment.[2,3] It mainly affects patients aged between 20 and 50 years, with its prevalence in Spain ranging between 50 and 60 cases per 100 000 inhabitants.[3]

The clinical manifestations of this disease appear as signs and symptoms with ample clinical variability, depending on the location of the demyelinating lesions which can occur throughout the central nervous system.[4] In many cases, the organisation of movement is affected in all its aspects. Simultaneously, posture control suffers the same adaptive problems, with balance disorders along with altered functionality and fatigue being the most disabling symptoms and present in up to 78% of cases.[5] The result is an anomalous gait with reduced mobility caused by the involvement of balance during walking. Patients typically present an increased support base, with greater instability during the start of motion or changes of direction. This postural instability, along with gait alterations, also represents a limitation in activities of daily living and has an impact on quality of life.[6]

Although one of the objectives of neurorehabilitation is the training and improvement of balance, this appears as one of the symptoms most resistant to therapeutic interventions.[7] The absence of a curative treatment for the disease, along with its chronic course, have led to the exploration of alternative interventions aimed at controlling any of these disabling symptoms. Unfortunately for the medical community, there are no therapeutic programmes with enough continuity to provide long-term results.

In recent years there have been reports that the transmission of vibratory stimuli throughout the organism produces a series of beneficial physiological responses which depend on the characteristics of these stimuli. Vibration generated by a platform and transmitted to the body (Whole Body Vibration, WBV), activates a multitude of sensory receptors, from cutaneous to muscular. This has a particular impact on the stretching of muscle spindles through reflex activation of the alpha motor neurons which cause a tonic vibration reflex responsible for reflex muscle contraction.[8,9] When combined with voluntary muscle contraction,[10] this leads to an increase in synchronisation of motor units (MU), which in turn helps to improve muscle strength and functionality.[11]

There also appears to be an activation of higher motor centres, with an improved muscular and proprioceptive response. This could explain the improvements in balance obtained through its application.[12,13]

However, several authors have evaluated the acute effects on young adults of a single exposure to vibration