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ORIGINAL ARTICLE

Correlation between gait speed and muscular strength with balance for reducing falls among elderly[☆]

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KEYWORDS

Falls;
Elderly;
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Abstract

Background: Evidence of the benefit on proprioceptive neuromuscular facilitation for reducing falls in older people does not exist.

Objective: The aim of this study is to evaluate the effects of proprioceptive facilitation over falls and biomechanical variables, in comparison to standard treatment and control groups.

Materials and methods: Series cases comparative for the 24 participants were recruited and randomly assigned to 3 groups. *Group 1*, proprioceptive neuromuscular facilitation, *group 2*, standard treatment, and *3* control. Falls and biomechanical variables were measured before and after. χ^2 was used for falls and multiple regression for biomechanical variables.

Results: Participants had similar falls in previous year. Women had higher falls in a relation 7:1 women-men. After intervention, there was no difference between 3 groups. A correlation exist between muscular strength and gait speed with one foot position time $r^2 = 0.67$, $p = 0.02$.

Conclusions: Improving 1 kg-force of muscular strength of pelvic limb and 0.1 m/s in gait speed, balance (unipodal position time) increases balance by 11.3%. After 3 months of intervention group 2 got 7.9 kg-force and 0.26 m/s of profit, while group 1 had 4.1 kg-force and 0.15 m/s and control group 2.4 kg-force and 0.1 m/s.

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PALABRAS CLAVE

Caídas;
Ancianos;
Biomecánicos

Correlación entre velocidad de marcha y fuerza muscular con equilibrio para reducir caídas en ancianos**Resumen**

Antecedentes: Los estudios sobre caídas en ancianos no definen claramente el efecto de la facilitación neuromuscular propioceptiva para reducir sus caídas y sus variables asociadas.

Objetivo: Evaluar los efectos de la facilitación propioceptiva sobre caídas y las variables biomecánicas relacionadas con la marcha en ancianos.

Material y métodos: Series de casos comparativas en las que participaron 24 pacientes, quienes se asignaron aleatoriamente a 3 grupos de 8 participantes: *grupo 1*, tratamiento de facilitación neuromuscular propioceptiva; *grupo 2*, tratamiento estándar, y *grupo 3*, testigo. Se midieron las caídas y variables biomecánicas relacionadas con: fuerza muscular, velocidad de marcha, cinestesia, tiempo de posición unipodal y tiempo de reacción muscular. Se aplicó χ^2 y regresión múltiple en las variables en estudio.

Resultados: Los grupos fueron equivalentes en la edad y en caídas durante el año previo ($p=0.20$). Las caídas fueron más frecuentes en las mujeres en una relación 7:1. Posterior a la intervención, existió una disminución significativa en la caída de los participantes de los 3 grupos. Existió correlación entre la fuerza muscular y velocidad de marcha con el tiempo de posición unipodal ($r^2=0.67$; $p=0.02$).

Conclusiones: Aumentando 1 kg-fuerza del miembro pélvico y 0.1 m/s en la velocidad de marcha mejora el equilibrio (tiempo de posición unipodal) un 11.3%. Posterior a 3 meses de la intervención el grupo 2 obtuvo un aumento de 7.9 kg-fuerza y 0.26 m/s, mientras que el grupo 1 obtuvo 4.1 kg-fuerza y 0.15 m/s, y el grupo control tuvo 2.4 kg-fuerza y 0.1 m/s.

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Background

Falls are “involuntary events whereby one loses one’s balance and falls to the ground or another firm surface which breaks that fall”. There are many reasons for falls and they should be considered as a public health problem.¹ 37 million falls requiring medical attention are reported annually. Their incidence in the elderly ranges from 25% to 35%; Prevalence ranges from 30% to 50%. The female-male ratio in adults is 2.7–1 and the probability of recurrent falls in people with a history of falls is 52%.² It is a frequent event amongst the elderly.

In Mexico there are 8.8 million people over the age of 60, and it is expected that this will rise to 15 million in 2020.^{3,4} Falls represent 30% of the causes of death. However, 10–35% of falls lead to fractures and of these, a hip fracture is the most common (10%),^{5,6} with a 5 year survival rate of almost 80%.^{7–17}

Several publications list risk factors involved in suffering from falls such as: a history of falls, mobility difficulties, insufficient visual abilities and balance, cognitive deterioration, living in an old peoples’ home, reduced functional independence, fear of falling, depression, anti-arrhythmic medication and psychotropic drugs.^{7–15}

There is a close association between the balance of the musculoskeletal system and the risk of presenting with a fall.^{10,18–20} It has also been shown that balance has no lineal correlation with age.^{10,20–22}

Despite the importance of falls on the quality of life and in association with increased morbidity and mortality

in the elderly, no alternative methods, such as proprioceptive neuromuscular facilitation,^{13,23–25} have been explored against standard procedures based on the use of flexibility and muscular strength.^{5,10–12,17,19,22,26–29}

The aim of our study is therefore to evaluate the affectivity of proprioceptive neuromuscular facilitation, comparing it with standard treatment used for the prevention of falls in the elderly.

Material and methods

A comparative case series with 24 participants in the study who were randomly assigned to 3 groups, with 4 men and 5 women in each one. *Group 1*, proprioceptive neuromuscular facilitation, *group 2*, standard treatment, and *group 3* control group.

At the start of the assessment clinical and epidemiological variables were measured which included: age, characteristics of the home, educational level, mental state tests, depression and fear of falling. Data was also collected regarding: weight, height, and body mass index.

The following were measured before and after treatment: falls, muscular strength biomechanical variables with dynamometry, gait speed (standard test), synaesthesia (digital goniometry), one foot position time and time of muscular reaction (reaction to computerised visual and auditory stimulus).

The procedures, risks and benefits were explained in detail to each patient and their written consent to

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