



REVIEW ARTICLE

Effect of ankle-foot orthosis on postural control after stroke: A systematic review[☆]

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KEYWORDS

Ankle-foot orthosis;
Balance;
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Abstract

Introduction: Stroke is currently the main cause of permanent disability in adults. The impairments are a combination of sensory, motor, cognitive and emotional changes that result in restrictions on the ability to perform basic activities of daily living (BADL). Postural control is affected and causes problems with static and dynamic balance, thus increasing the risk of falls and secondary injuries. The purpose of this review was to compile the literature to date, and assess the impact of ankle-foot orthosis (AFO) on postural control and gait in individuals who have suffered a stroke.

Development: The review included randomised and controlled trials that examined the effects of AFO in stroke patients between 18 and 80 years old, with acute or chronic evolution. No search limits on the date of the studies were included, and the search lasted until April 2011. The following databases were used: Pubmed, Trip Database, Cochrane library, Embase, ISI Web Knowledge, CINHALL and PEDro. Intervention succeeded in improving some gait parameters, such as speed and cadence. However it is not clear if there was improvement in the symmetry, postural sway or balance.

Conclusions: Because of the limitations of this systematic review, due to the clinical diversity of the studies and the methodological limitations, these results should be considered with caution.

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PALABRAS CLAVE

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Efecto de la ortesis de tobillo pie en el control postural tras el accidente cerebrovascular: revisión sistemática

Resumen

Introducción: El accidente cerebrovascular (ictus) actualmente es la primera causa de discapacidad permanente en la edad adulta por sus consecuentes secuelas, quedando una combinación de deficiencias sensoriales, motoras, cognitivas y emocionales que conducen a restricciones en su capacidad para realizar actividades básicas de la vida diaria (ABVD). El control postural se afecta y da lugar a problemas en el equilibrio estático y dinámico que incrementan el riesgo de caídas. El objetivo de la revisión consiste en realizar una revisión sistemática que permita valorar los efectos de las ortesis de tobillo (OTP) en el control postural y en la marcha, en sujetos que han presentado un ictus.

Desarrollo: Se incluyeron ensayos controlados y aleatorizados que analizaran los efectos de las ortesis de tobillo en pacientes con ictus de entre 18 y 80 años, con evolución aguda o crónica. La búsqueda de ensayos no tuvo limitación en fecha de inicio y se extendió hasta marzo de 2011. Se emplearon las bases de datos Pubmed, Trip Database, Cochrane Library Plus, Embase, ISI Web knowledge, CINHAl y PEDro.

Conclusiones: La intervención logró mejorar algunos parámetros de la marcha como velocidad y cadencia. Sin embargo, no está clara la mejora en la simetría del peso, el balanceo postural o el equilibrio. Las limitaciones de esta revisión sistemática, debidas a la gran diversidad clínica de los estudios que incluye y las limitaciones metodológicas de estos, justifican una lectura precavida de los resultados.

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Introduction

Cerebrovascular accident (stroke) is currently the leading cause of permanent disability in adults because of sequelae suffered by stroke patients.^{1,2} Stroke survivors exhibit a combination of sensory, motor, cognitive, and emotional deficits restricting their ability to perform basic activities of daily living (ADLs).²

Postural control refers to maintaining the position of the body in such a way as to achieve both stability and spatial orientation. Postural control requires complex interaction between the musculoskeletal and neurological systems. It involves muscle properties, range of motion, flexibility, biomechanical relationships between bodily regions, motor processes, sensory perception processes, and higher processing levels ranging from sensation to action with anticipatory and adaptive aspects.³

Postural control is impaired in patients with stroke, and this creates problems with static and dynamic balance⁴ which mainly manifest when external disturbances are present. Numerous studies have examined deficiencies in dynamic balance in patients with hemiparesis. Pay et al.⁵ found patients unable to successfully transfer weight in the frontal plane during the transition to single-limb stance. Di Fabio and Badke⁶ reported that instability was mainly found along the frontal plane in stroke patients. These problems with postural control may have severe consequences for the patient's physical function and psychosocial well-being, such as restrictions on activities, social isolation, or fear of falling, all of which may increase risk of falling and secondary injury.⁷ Furthermore, balance disorders and truncal ataxia during the rehabilitation period also constitute a prognostic factor for functional recovery post-stroke.⁸

Gait disorders are due to motor control deficits that are secondary to muscle tone disorder, ataxia, agnosia, perceptual difficulties, and others. In general, walking patterns in these patients are characterised by lower metabolic efficiency. Deficient postural control explains the metabolic expenditure in these subjects. In fact, lack of intermuscular coordination by the central nervous system explains the presence of unstable gait, asymmetric gait pattern and weight distribution, and increased risk of falling. Normally, these patients walk at slower speeds with shorter step and stride lengths and longer double stance times at the expense of single stance times. At the kinematic level, abnormalities vary enormously from one patient to another: flexure of the hip or knee during the stance phase, hyperextension of the knee during the stance phase, incorrect hip and knee flexion during the swing phase, excessive contralateral pelvic drop, contralateral trunk lean, pes equinovarus, or excessive hip abduction during the swing phase, and others.⁹ Therefore, restoring gait is a very important objective for neurological rehabilitation. In fact, patients identify restoring gait as the first and most important objective of post-stroke rehabilitation.^{10–12}

One common finding in the gait of stroke patients is varus deformity of the foot, which is frequently caused by spasticity of the posterior tibial muscle. If spasticity is not severe (1–2 on the Ashworth scale), use of an ankle-foot orthosis (AFO) may provide sufficient support.¹³ Few published studies have evaluated the effect of AFOs on patients with chronic hemiplegia. Currently available clinical evidence consists of just a few articles with small sample sizes and poor methodological quality.¹⁴

AFOs are braces used to provide anterior-posterior and medial-lateral stability to the ankle joint, while

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