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REVIEW ARTICLE

Cerebral palsy and the use of positioning systems to control body posture: current practices☆

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Abstract
Introduction: One of the consequences of poor postural control in children with cerebral palsy is hip dislocation. This is due to the lack of weight-bearing in the sitting and standing positions. Orthotic aids can be used to prevent onset and/or progression.
Objective: The aim of this study is to analyse the effectiveness of positioning systems in achieving postural control in patients with cerebral palsy, and discuss these findings with an emphasis on what may be of interest in the field of neurology.
Discussion: We selected a total of 18 articles on interventions in cerebral palsy addressing posture and maintenance of ideal postures to prevent deformities and related problems. The main therapeutic approaches employed combinations of botulinum toxin and orthoses, which reduced the incidence of hip dislocation although these results were not significant. On the other hand, using positioning systems in 3 different positions decreases use of botulinum toxin and surgery in children under 5 years old. The drawback is that these systems are very uncomfortable.
Conclusion: Postural control systems helps control hip deformities in children with cerebral palsy. However, these systems must be used for prolonged periods of time before their effects can be observed.

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PALABRAS CLAVE
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Parálisis cerebral infantil y el uso de sistemas de posicionamiento para el control postural: estado actual del arte

Resumen
Introducción: Una de las consecuencias de la mala calidad en el control postural de los niños con parálisis cerebral es la luxación de caderas. Esto es debido a la falta de carga de peso en las posiciones de sedestación y bipedestación. Para ello, se puede hacer uso de ayudas ortésicas para evitar su aparición o progresión.
Objetivo: El objetivo de este estudio es analizar la efectividad de dichos sistemas de posicionamiento en el control postural de pacientes con parálisis cerebral, y discutir estos hallazgos a la luz de lo que pueda ser de interés para la neurología.
Discusión: Se seleccionaron un total de 18 artículos de intervenciones de la parálisis cerebral infantil que abordaban el ámbito de la postura y su mantenimiento en posiciones idóneas para evitar deformidades y problemática relacionada. Los principales resultados terapéuticos fueron: combinación de toxina botulínica junto con ortesis, que reduce la incidencia en la luxación de caderas, aunque estos resultados no fueron significativos, y el empleo de sistemas de posicionamiento en 3 posturas diferentes, que supone un descenso en el empleo de la toxina botulínica y de las intervenciones quirúrgicas en niños menores de 5 años. El inconveniente es que resultan muy incómodos.
Conclusión: El empleo de sistemas de control postural produce beneficios en el control de las deformidades de cadera en niños con parálisis cerebral. Sin embargo, su utilización debe ser prolongada en el tiempo para que los efectos sean objetivos.

Introduction

Human posture during different activities requires adjusting the body's position to maintain the centre of gravity within the base of support.[1,2] Postural control depends on the visual, somatosensory, and vestibular systems as well as on the central nervous system's ability to interpret information and execute actions.[3–8]

This ability to adjust posture is impaired in children with cerebral palsy (CP). Problems in adapting the degree of muscle contraction may explain why these children display excessive coactivation of antagonist muscles groups, especially during such complex voluntary tasks as reaching and balancing.[9,10]

Maintaining postural control frequently requires excessive activation of antagonist muscles.[11–13] The most frequently affected area is the axial plane of the human body: over 65% of all patients with CP have scoliosis, and between 28% and 60% have hip problems.[14,15]

Hip problems are therefore a common complication in CP as well as a source of pain during adolescence and adulthood. Although the hips of children with CP are normal at birth, they subsequently undergo structural changes due to imbalances between adductor/abductor and flexor/extensor muscles, and also because of decreases in muscle extension and joint range of motion.[16]

These problems are especially marked in children with more severe neurological impairment and those incapable of walking or weight-bearing: delays in reaching these motor milestones increase the risk of hip deformation, whereas standing promotes acetabular development.[14,15,17] Patients with spasticity show alterations in the hip migration percentage (HMP) and acetabular index (AI); these indicators are used to evaluate hip deformities (subluxation or dislocation).[18]

Therefore, clinical practice aims to provide early interventions, including use of special seats, night-time support, standing support, and orthotic aids, as well as personalised therapies. Support devices include custom-moulded sitting and standing aids[19]; orthotics such as the SWASH orthosis ensuring hip abduction in the sitting, standing, and walking positions[20]; and postural support systems such as the Chailey adjustable postural support,[21] which allows hip abduction in lying, sitting, and standing positions and is frequently used as a complement to physical therapy. The purpose of our review article is to determine the effectiveness of interventions with different postural support systems and examine their benefits for CP patients with, or at risk of, hip subluxation or dislocation.

Development

We conducted a literature search in MEDLINE, Ovid, CINHAL, PEDRo, and Índice Médico Español using the following keywords: cerebral palsy, hip deformity, subluxation, subluxated, hip subluxation, postural control, postural management, standing, standing posture, seated, seated posture, and corset, both in English and in Spanish. We also searched for combinations of these terms and truncated the keywords to retrieve all possible variations.