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Research Paper

The effect of asymmetrical limited hip flexion on seating posture, scoliosis and windswept hip distortion

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ABSTRACT

Background: Postural asymmetries with seating problems are common in adults with cerebral palsy.
Aims: To analyse the prevalence of asymmetrical limited hip flexion (< 90°) in adults with CP, and to evaluate the association between asymmetrical limited hip flexion and postural asymmetries in the sitting position.
Methods and procedures: Cross-sectional data of 714 adults with CP, 16–73 years, GMFCS level I–V, reported to CPUP, the Swedish cerebral palsy national surveillance program and quality registry, from 2013 to 2015. Hip range of motion was analysed in relation to pelvic obliquity, trunk asymmetry, weight distribution, scoliosis and windswept hip distortion.
Outcomes and results: The prevalence of asymmetrical limited hip flexion increased as GMFCS level decreased. Of adults at GMFCS level V, 22% had asymmetrical limited hip flexion (< 90°). The odds of having an oblique pelvis (OR 2.6, 95% CI:1.6–2.1), an asymmetrical trunk (OR 2.1, 95% CI:1.1–4.2), scoliosis (OR 3.7, 95% CI:1.3–9.7), and windswept hip distortion (OR 2.6, 95% CI:1.2–5.4) were higher for adults with asymmetrical limited hip flexion compared with those with bilateral hip flexion > 90°.
Conclusions and implications: Asymmetrical limited hip flexion affects the seating posture and is associated with scoliosis and windswept hip distortion.

What this paper adds?

This paper contributes to the field of seating analysis for individuals in wheelchairs. It shows that asymmetrical limited hip flexion (< 90°) is present in about 22% of individuals with cerebral palsy who are classified at GMFCS level V. It confirms that the presence of asymmetrical limited hip flexion (< 90°), increases the odds of pelvic obliquity, trunk asymmetry, scoliosis, and windswept hip distortion. Therefore, asymmetrical limited hip flexion needs to be ruled out or compensated, especially in individuals with spastic bilateral CP at GMFCS level V, who are in a poor seating posture.

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1. Introduction

1.1. Cerebral palsy

Cerebral palsy is a well-recognised neurodevelopmental condition that manifests in early childhood and persists throughout life (Rosenbaum et al., 2007). It has been attributed to a non-progressive disturbance that occurs in the developing fetal or infant brain. Cerebral palsy is the most common physical disability in childhood, with a prevalence of 2–2.4/1000 live births in Europe (Nordmark, Hägglund, & Lagergren, 2001; SCPE, 2002). In Sweden, the survival rate to 20 years of age is 60% among the most severely disabled children with cerebral palsy (Westbom, Bergstrand, Wagner, & Nordmark, 2011), although the survival rate in Britain is lower (Hutton & Pharoah, 2006).

1.2. Contractures and asymmetries

The term "joint contractures" is used to describe the loss of passive range of movement in diarthrodial joints (Wong, Trudel, & Laneuville, 2015). Long-lasting reduction of spasticity does not prevent contracture development (Tedroff, Lowing, Jacobson, & Astrom, 2011), and in pure immobilisation, the role of arthrogenic structures in contracture development increases with time, in such a way that immobilisation in flexion leads to limited extension but allows more flexion (Trudel & Uhthoff, 2000). Pope (Pope, 2007) described the effect of sitting with asymmetrical limited hip flexion ($< 90^{\circ}$), where the ipsilateral side of the pelvis will go up and in a forward direction, directing the trunk to the contralateral side. Lateral spinal curvature is needed to compensate for the asymmetry caused by pelvic obliquity (Porter, Michael, & Kirkwood, 2007). In adults with cerebral palsy who have lower levels of motor function, more postural asymmetries are present in the sitting position than when standing, and these asymmetries are associated with a limited range of motion, scoliosis, and the inability to change position (Rodby-Bousquet, Czuba, Hägglund, & Westbom, 2013).

1.3. Aim

The aim of this study was to analyse the prevalence of asymmetrical limited hip flexion less than 90° (ALHF $< 90^{\circ}$) in individuals with cerebral palsy and to evaluate the association between ALHF $< 90^{\circ}$ and asymmetrical seating posture, the occurrence of scoliosis, and windswept hip distortion.

2. Methods

2.1. Ethical approval and consent

Ethical approval was granted by the Medical Research Ethics Committee at Lund University (LU 2009-341), and permission was obtained to extract data from the CPUP registry. All participants consent to research based on reported data. No individual details are presented.

2.2. Data collection and participants

This cross-sectional study was performed based on data from the national surveillance program and quality registry for cerebral palsy in Sweden (CPUP) (Alriksson-Schmidt et al., 2017). Data were extracted from the most recent reports for all adults with cerebral palsy included in the registry between 1st of January 2013 and 31st of December 2015. Inclusion and exclusion criteria were defined by the Surveillance of Cerebral Palsy in Europe (SCPE, 2002), and subtypes were classified into spastic unilateral, spastic bilateral, ataxic, and dyskinetic cerebral palsy. A total of 714 adults comprising 357 men and 357 women with a median age of 23 years (range 16–73 years) were reported to the CPUP registry. The subjects' gross motor function ranged from GMFCS level I (n = 159), II (n = 150), III (n = 114), IV (n = 122) to level V (n = 170) (Table 1). The distribution of participants' neurological subtypes was as follows: spastic unilateral (n = 156), spastic bilateral (n = 385), ataxic (n = 25), dyskinetic (n = 92), and mixed or unclassified subtypes (n = 42). Subtypes were not reported for 14 adults.

2.3. Classifications and measurements

All assessments were performed by local physiotherapists and occupational therapists in a standardised manner employing an assessment form and an accompanying manual (www.cpup.se).

2.3.1. Gross motor function classification system

Gross motor function was classified using the expanded and revised version of the Gross Motor Function Classification System (GMFCS) levels I–V, age band 12–18 years (Palisano, Rosenbaum, Bartlett, & Livingston, 2008). Even though GMFCS was developed for children, it has also been shown to be accurate for use in adults with cerebral palsy (Jahnsen, Aamodt, & Rosenbaum, 2006; McCormick et al., 2007).