**Gait compensations for excessive anteversion in individuals with cerebral palsy**

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**BACKGROUND**

Excessive internal hip rotation (IHR) is a common gait abnormality in individuals with cerebral palsy (CP) [1,2]. It may be a compensatory mechanism for functionally weak hip abductors resulting from excessive femoral anteversion. However, individuals with excessive anteversion may not always demonstrate IHR [3-4], suggesting that excessive anteversion may not always lead to functional weakness or there are other gait compensations. Contralateral pelvic drop and ipsilateral trunk lean may be compensations for weak hip abductors [5,6].

**OBJECTIVE**

Identify the prevalence of anticipated gait compensations for functional adductor weakness secondary to excessive anteversion in individuals with CP, including:

1. internal hip rotation
2. contralateral pelvic drop
3. ipsilateral trunk lean

**PARTICIPANTS & SETTING**

- CP (di-, tri-, or quadriplegia) vs. CP (hemiplegia)
- Excessive anteversion (≥50°)
- Barefoot gait analyses prior to a femoral derotation osteotomy (FDO)

**METHODS**

- Mean hip rotation, pelvic obliquity, and trunk obliquity during stance
- Abnormal: >1 SD of typically developing
- Trunk data available for a subset of individuals

**STATISTICS**

- Group differences assessed with Fisher’s exact test (p<0.05)
- 95% confidence intervals of the odds ratio

**RESULTS**

- 1282 limbs of individuals with bilateral involvement (n=630 trunk data)
- 115 limbs unilateral involvement (n=63 trunk data)
- 12% of bilaterally-involved individuals had kinematics within normal limits (±1 SD) at the trunk, pelvis, and hip
- Prevalence of excessive anteversion (Fig. 1) and gait patterns (Fig. 2) are shown. Significant differences between groups are shown in Table 1.

**DISCUSSION**

The most prominent adaptation was IHR

Relatively less frequent pelvic drop and trunk lean compared to IHR suggests that only IHR is a compensation and not the other two gait patterns

12% bilaterally-involved patients did not use any anticipated compensation

11-17% walked with contralateral trunk lean (↑ hip abductor moment)

Secondary functional hip abductor weakness is not ubiquitous

- measurement error of anteversion or hip rotation [7,8]
- or other priorities (toe clearance, stability, energy, pain)

Since physiological and functional hip abductor weakness is a concern in this population, the higher prevalence of ipsilateral compared to contralateral pelvic drop suggests that ipsilateral drop may be a more effective means of decreasing hip abductor moment.

**CONCLUSIONS**

The anticipated compensations for individuals with CP who have excessive anteversion were not always the most frequently used gait pattern for each joint/segment. Often, neutral kinematics were more commonplace. Future work should investigate what characteristics of these subgroups are driving these gait compensations (or lack thereof) and if they have differential outcomes after FDO, including risk for recurrence after an FDO.

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**References**


**Image 1:** Prevalence (%) of excessive anteversion for individuals.

**Image 2:** Prevalence (%) of gait characteristics for excessive anteversion. Anticipated gait compensations are bolded & separated.