

Pes Valgus and Tibial Torsion in Ambulatory Children with Cerebral Palsy

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INTRODUCTION:

Out-toeing is a common gait deviation in individuals with cerebral palsy (CP) causing lever arm dysfunction and functional limitations. Multiple possible causes for out-toeing have been reported in the literature, with pes valgus being one of the most common. However, the cause of out-toeing is often due to multiple factors. External tibial torsion can also contribute to out-toeing and could be missed without detailed clinical exam. The purpose of this study was to examine factors associated with external tibial torsion in patients with CP and pes valgus.

METHODS:

This retrospective study examined ambulatory children with CP (GMFCS I-IV) seen in our gait laboratory who had bilateral or unilateral pes valgus identified as eversion of the hindfoot with or without forefoot abduction during the stance and/or swing phase, as seen on the video record or indicated by pedobarograph data. Patients were excluded if they had previous lower extremity orthopaedic surgery. Tibial torsion was measured using the transmalleolar axis angle (TMA) and was considered excessively external if TMA was $>20^\circ$ external.

RESULTS:

The study included 247 patients (159 male; age 10.4 years, SD 3.4) ages 4-19 years with 422 valgus feet (175 bilateral). External tibial torsion ($>20^\circ$ external) was observed in 11.6% of limbs (95% CI=[8.9, 15.1%]). Tibial torsion became more external with increasing age ($b=0.12$, 95% CI=[0.02, 0.22], $p=0.02$), and the odds of having excessive external tibial torsion increased with age (OR 1.12, 95% CI=[1.02, 1.24], $p=0.02$). TMA was weakly related to dorsiflexion range of motion (ROM) with the knee extended ($b= -0.10$, 95% CI=[-0.18, -0.02], $p=0.02$) and hindfoot inversion ROM ($b=0.19$, 95% CI=[0.06, 0.31], $p=0.005$), becoming more external with increased dorsiflexion ROM and less external with greater hindfoot inversion. Tibial torsion was not related to gender, GMFCS level, plantarflexor spasticity, or knee extension ROM.

DISCUSSION AND CONCLUSION:

When addressing out-toeing in an individual with CP, all contributing factors need to be addressed to achieve the greatest functional benefit for the patient. Our results indicate that excessive external tibial torsion is present in over 10% of patients with CP and pes valgus. External tibial torsion increases with age, increased dorsiflexion, and limited hindfoot inversion ROM. Evaluating external tibial torsion as a possible contributor to out-toeing needs to be considered in older patients with CP who have planovalgus deformity with limited hindfoot inversion. Missing the external tibial torsion when correcting the planovalgus results in under correction of the out-toeing gait.