The Effect of Plantarflexor Lengthening on Foot Pressure in Children with Cerebral Palsy
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Purpose: Tendo-achilles and gastrocnemius lengthenings are often performed in children with cerebral palsy (CP) to correct equinus. Foot deformities are common in children with CP and can be associated with plantarflexor weakness or contracture. Pedobarographs quantify dynamic foot pressure and can be used to identify varus and valgus foot postures underlying equinus and to evaluate surgical outcomes. The purpose of this study was to assess the effects of plantar flexor lengthenings on dynamic foot pressures of children with CP using pedobarograph.

Methods: Ninety-seven children with CP were recruited in this Level II IRB approved prospective longitudinal comparison study. Of the 97, 13 children (8 unilaterally, 5 bilaterally involved) underwent plantarflexor lengthening (17 legs) and were evaluated with pedobarograph and physical exam at preoperative, short-term (within 14 months of surgery), and long-term (between 14 and 27 months from surgery) post-operative visits. The average age at surgery was 4.9±2.0 years. Results were compared to age-matched normative data, and a control group of children with CP who did not have surgery and were matched for age and pattern of involvement. Outcome measures included the coronal plane pressure index (CPPI), and the impulse from the heel, medial midfoot, lateral midfoot, medial forefoot, and lateral forefoot.

Results: Significant equinus correction was observed with increases in heel impulse and dorsiflexion passive range of motion (p<0.05) in children with CP that underwent plantar flexor lengthening surgery. CPPI and medial midfoot impulse increased and lateral forefoot impulse decreased (p<0.05) demonstrating an increase in valgus foot posture post-operatively. No significant changes in foot pressure were noted in the matched control group with CP. When separated by pre-operative presentation, children presenting with varus initially moved toward valgus (p<0.01), while those patients initially in valgus demonstrated no significant change in varus/valgus foot posture.

Conclusion: In addition to obtaining a plantigrade foot during gait, significant increases in CPPI, medial midfoot impulse and a significant decrease in lateral forefoot impulse show that plantar flexor lengthening has a significant effect on foot pressure and creates a trend from varus to valgus in children with cerebral palsy.

Significance: Plantarflexor lengthening procedures are common in children with CP. In children with CP with equinus, varus or valgus foot deformities are often present. Surgical correction of the equinus will usually drive the foot toward valgus. In young children there should be great caution to avoid over treating varus at the time of equinus correction to avoid overcorrection.