FOREFOOT DEFORMITIES IN CHILDREN WITH UNILATERAL CEREBRAL PALSY

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INTRODUCTION

Foot deformity is the most frequent musculo-skeletal deformity in children with cerebral palsy (CP) and occurs in 93% of cases¹. Pain starts in the foot, especially in walking CP children (GMFCS I, II)², and leads to walking limitations, balance disorders, wounds, aesthetic disorders and difficulties to benefit from adapted shoes.

Metatarsus Adductus (M.Adductus) is the most common foot deformity in children with or without disorder³, occurring on 1-2/1000 births⁴. In 4-14%, evolution is not favorable at 5 years⁴. In that case, neuro-muscular disease diagnostic such as CP or spina bifida have to be considered.

Midfoot and backfoot deformities are well described in children with CP (equinus, equinovarus, planovarus foot). However data regarding forefoot deformities in cerebral palsy are missing or remain scarce.

Purpose of the study: (1) To quantify the prevalence of forefoot deformities in hemiplegic foot in walking children with unilateral CP and compare it to the non plegic side (2) to identify correlations between forefoot and backfoot deformities, lower limb torsional disturbance, selective motor control and spasticity.

METHOD

✓ Retrospective study based on the motion analysis laboratory database in Brest, Britain, France, between august 2006 and May 2017.

- ✓ **Inclusion criteria :**
 - Children (<18 YO)
 - Unilateral CP
 - GMFCS I, II or III
- ✓ **Exclusion criteria :**
 - Lower limb surgery
 - Botulinum toxin injection < 3month (BTI)

Flow chart

Standardized clinical examination:

- Forefoot deformities (normal axe, adductus, abductus)
- Midfoot, Backfoot and Ankle deformities
- Strength, Spasticity (gastrocnemius, tibialis posterior, peroneus longus, hamstrings, adductors) and selective motor control (Boyd)
- Leg length discrepancy, tibial and femoral torsion

✓ **Statistical Analyses:** Khi 2 Test and Spearman Correlation Test

RESULTS

Characteristic Population

▪ Age	8,52 YO +/- 3,47			
▪ Sexe	0,96 B / 1 G	25 B (49,01%)	26 G (50,98%)	
▪ Hemiplegic side	1,125 R / 1 L	27 R (52,94%)	24 L (47,05%)	
▪ GMFCS score	1,29 +/- 0,46	36 I (70,58%)	15 II (29,41%)	0 III (0%)
▪ Botulinum toxin injection	YES: 20 (39,21%)		NO: 31 (60,78%)	
	- Last BTI	8,55 month +/- 7,78 month		

Forefoot deformation:

Forefoot Deformities: more frequent on plegic side (p=0,0229)

- Hemiplegic side:
 - **25 M.Adductus (49%)**
 - 25 Normal axe (49%)
 - 1 M. Abductus (2%)
- Non plegic side:
 - 12 M.Adductus (23,5%)
 - 36 Normal axe (70,6%)
 - 3 M. Abductus (5,9%)

Children with M.Adductus on the hemiplegic side:

- **more spastic on Gastrocnemius (Tardieu Scale) (p=0,025)**
- **increased frequency of Backfoot varus (p=0,0327)**

✓ M.Adductus on the hemiplegic side correlates with reduced **Gastrocnemius strength** on MRC scale (rho 0,44 ; p=0,0398)

CONCLUSION

Forefoot deformities were statistically more frequent on the hemiplegic side of children with unilateral CP and Metatarsus Adductus was the most frequent deformity.

This study highlighted that **Metatarsus Adductus** was statistically associated with **spasticity on ipsilateral gastrocnemius** and **backfoot varus deformities**, and **correlated with gastrocnemius strength**, in favor of the hypothesis that forefoot deformation was associated with ipsilateral neuromuscular or musculoskeletal disorders.

Our results should help the comprehension, prevention and care of forefoot deformities in this population.

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