SPASTIC HEMIPARETIC GAIT PATTERN AFTER OVER 6 MONTH PERIOD OF USING CARBON-FIBRE ANTERIOR LEAF SPRING AFO – FLAWS AND ADVANTAGES

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INTRODUCTION AND AIM

Clinical gait analysis (CGA) is an important component of evidence based medicine and rehabilitation. Proper physiotherapeutic evaluation combined with data gathered during 3D CGA can be used for goal setting and evaluation of the efficiency of physiotherapeutic interventions and higher quality of rehabilitation services. The 3D CGA can be used as an objective evaluation tool for finding the right orthotics for gait pattern correction. The use of carbon-fibre anterior leaf spring orthotics (**picture 1**) to cure drop foot in hemiparetic children has been a growing trend over the past years.

The aim of the study is to find out the main problems in gait pattern of children who have used carbon-fibre anterior leaf spring AFOs for more than six months.

Picture 1. *Example of carbon anterior-leafspring otrhotics*

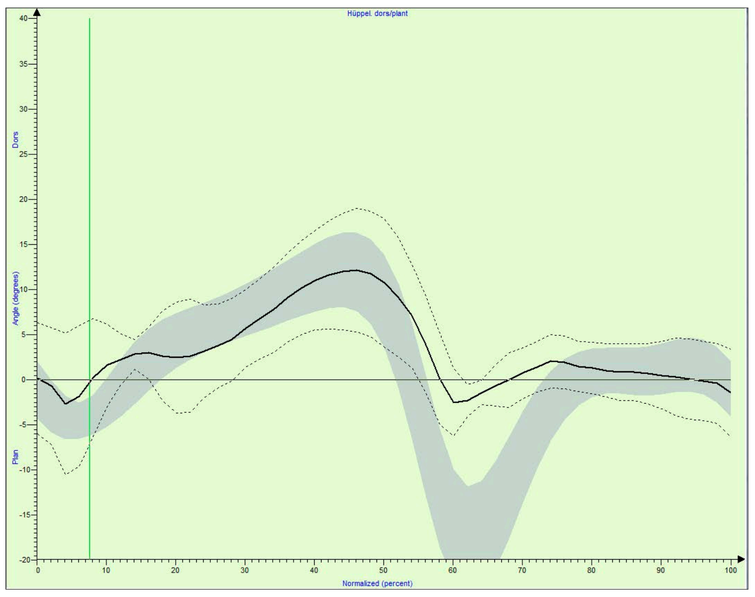
PATIENTS/MATERIALS AND METHODS

3D CGA was conducted on five right side hemiparetic children mean age 10.4±3.4 (± SD) years. All the patients had been using the carbon-fibre anterior leaf spring AFO for more than six months. The reason for wearing orthotics was on all occasions drop foot and incorrect prepositioning of the foot in swing phase. During the study, all patients used the orthotics with their usual footwear. Motion in sagittal plane was analysed and compared with barefoot trials.

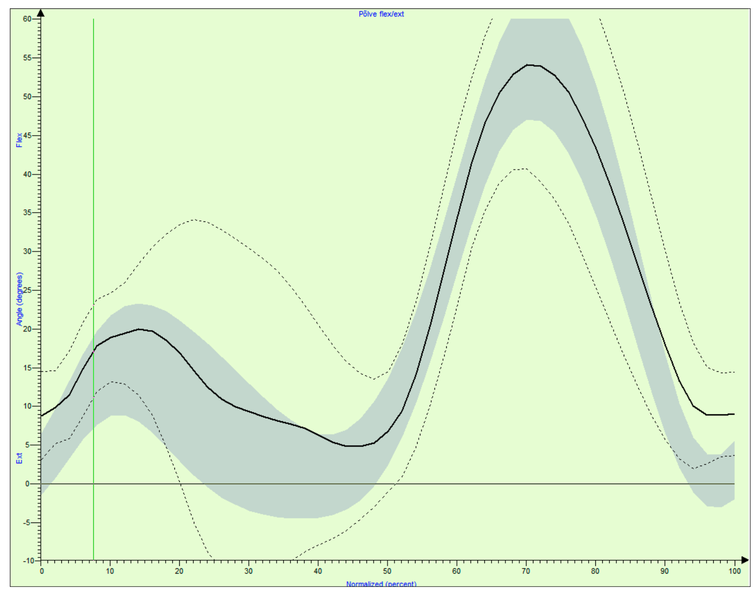
3D Vicon Gait Analysis System and two AMTI platforms were used to capture the data. Markers were placed according to Davis model. Physiotherapeutic assessment was carried out prior to the gait analysis. For interpretation 2 good trials with orthotics and footwear and barefoot were selected to compare the sagittal plane movement of ankle, knee and hip shown in degrees mean ± SD

RESULTS

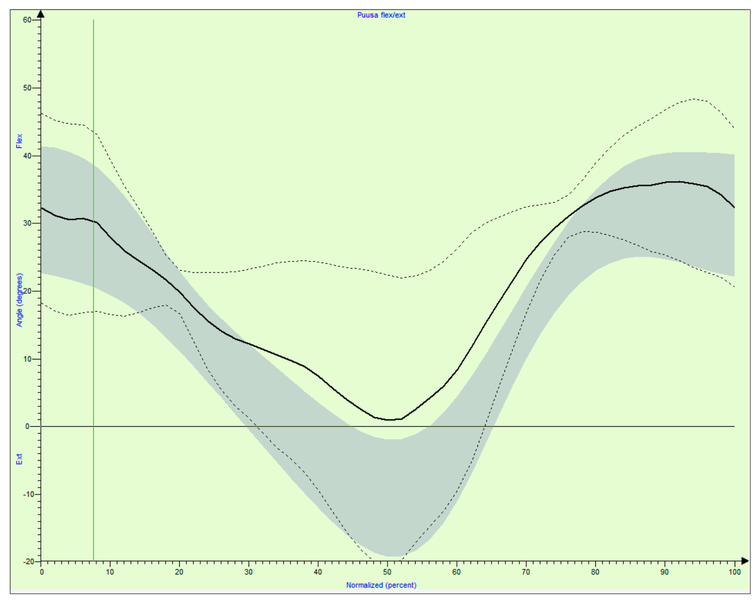
The angles were looked at in sagittal plane during initial contact (IC), midstance (30% of gait cycle) and during late swing. IC occurred with ankle dorsiflexion barefoot -13.3±5.1, with orthotics 0.1±6.1. (**figure 1**). The knee flexion angle was 10.7±8.5 and 8.7±5.7 (**figure 2**). accordingly and hip flexion barefoot 34.4±5.6 and with orthotics 32.2±14 (**figure 3**). During midstance the ankle angle barefoot was 6.6±1.7 and with orthotics 4.4±4.6. Knee flexion angle was 7.4±2.7 and 9.9±21.7 accordingly and hip angles 11.4±4.7 barefoot and 12.9±9.9 with orthotics. During late swing the ankle angle barefoot was -15±4.2, with orthotics 1.5±4.9. Knee angles showed 8.9±7.5 and 9.0±5.4 accordingly and hip angles barefoot 33.6±5.2 and with orthotics 32.3±11.7 (see **table 1**). In addition the orthotics was seldom incorrectly used – wrong size, loose fitting, incorrect footwear and absence of insoles.



↑ ***Figure 1.*** *Sagittal plane anklejoint flexion/extention graph with orthotics (mean ± SD)*



↗ ***Figure 2.*** *Sagittal plane kneejoint flexion/extention graph with orthotics (mean ± SD)*



➔ ***Figure 3.*** *Sagittal plane hipjoint flexion/extention graph with orthotics (mean ± SD)*

	Barefoot (degrees mean ± SD)	*With orthotics (degrees mean ± SD)*
INITIAL CONTACT		
Ankle dorsiflexion	*-13.3±5.1*	*0.1±6.1*
knee flexion	*10.7±8.5*	*8.7±5.7*
hip flexion barefoot	*34.4±5.6*	*32.2±14*
MIDSTANCE (30% GC)		
Ankle dorsiflexion	*6.6±1.7*	*4.4±4.6*
knee flexion	*7.4±2.7*	*9.9±21.7*
hip flexion barefoot	*11.4±4.7*	*12.9±9.9*
LATE SWING		
Ankle dorsiflexion	*-15±4.2*	*1.5±4.9*
knee flexion	*8.9±7.5*	*9.0±5.4*
hip flexion barefoot	*33.6±5.2*	*32.3±11.7*

Table 1. *Results of the study (degree, mean ± SD)*

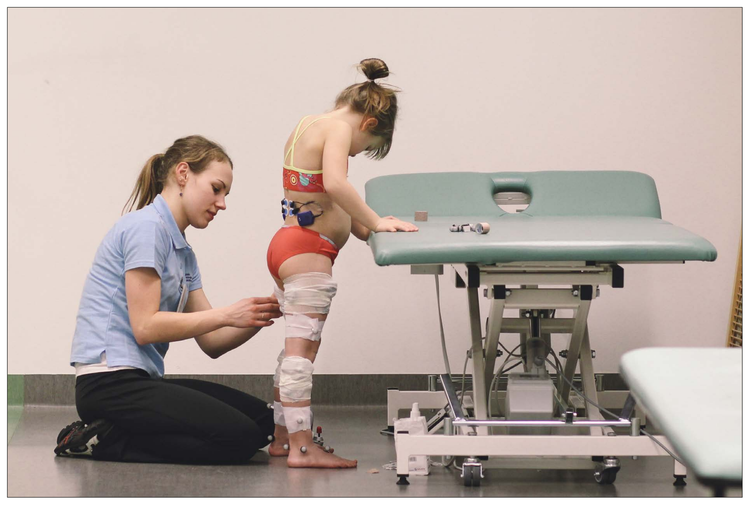


Photo: Silver Raidla

DISCUSSION AND CONCLUSIONS

Gait pattern improved with orthotics mostly regarding ankle joint motion, especially in initial contact. During midstance all three joints showed variable results in improvement. During late swing the knee extension was insufficient, which also resulted in poor ankle angle. In conclusion, it can be said that proper gait training is necessary to avoid habitual patterns like knee flexion in late swing which appeared in all five patents. In addition guidance for proper use of orthotics is necessary to avoid problems with choosing correct footwear, lose fitting and incorrect size options. This study is a good example of insufficient information given to patients while obtaining orthotics, therefore resulting in poor outcome.

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