THE USE OF A VARIABLE ABDUCTION ORTHOSIS IN THE CHILD WITH EARLY BRAIN LESION

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Abstract

Variable abduction orthosis (SWASH orthosis) and its function by describing an example of a girl with an early brain lesion is introduced in the article. It is a report on the twelve-year old girl's case with a spastic cerebral palsy. Many of standardized assessment protocols have been used during the assessment and analysis of her condition. Orthosis remarkably improves the quality of the movement patterns, it influences the greater gait speed, the cadence, greater single and double step length and step width. Considering the fact that the girl was capable of walking a longer distance than she was while walking without orthosis, advantages are revealed mostly during walking. Orthosis improves the stabilization of the pelvis and the trunk. SWASH orthosis considerably increases her autonomy and independence when moving and performing her daily activities.

INTRODUCTION

Early brain lesion causes the lesion of the central nervous system and slows down or hinders the child overall development. One of the most frequent consequences of such condition is cerebral palsy (1).

Cerebral palsy (CP) is not a disease. It is a condition that has been defined as »an umbrella term covering a group of non-progressive, but often changing motor impairment syndromes, which are secondary to lesions or anomalies of the brain arising in the early stages of its development« (2).

CP is classified according to a combination of two standards. One is based on anatomical distribution (hemiplegia, diplegia, quadriplegia...) and the other deals with the physiological aspects of the condition (spastic, dyskinetic, ataxic, mixed cerebral palsy...) (3).

METHODS AND SUBJECTS

Variable abduction orthosis

SWASH ortohosis is a variable abduction orthosis used for the stabilization of the hip and the pelvis. It influences the function of the entire body. SWASH is an abbreviation of an English word meaning: the Standing, Walking and Sitting Hip orthosis. Thus, it is a brace or a hip abduction orthosis used for standing, gait and sitting (4).

Orthosis enables a child to do everyday activities with no threat of hip dislocation. It increases the ligament strength and ligament flexibility, of other hip joint structures. It hiders the adductive gait model (scissor gait) and maintains the pelvis in the central position. Besides, it maintains the hip abduction and the adequate gait length. Orthosis improves the posture, standing and balance. It enables a better transfer and a greater mobility, learning to use less energy when walking and a better gait quality. Thus, it can be considered not only as a supplement but also an alternative to the operations (4).

Major components of the SWASH orthosis are: pelvic band; hip joint assembly; lateral uprights and thigh cuffs (Figure 1).

Figure 1: *SWASH orthosis*

The use of orthosis in the function

A girl was admitted to our Centre on the basis of the written order from the Committee of Specialists for classification of the children and adolescents with problems in physical and mental development in September 2003.

The condition of the girl when admitted: she has cerebral palsy (spastic diplegy) and epilepsy. She uses the wheelchair,

which she can run by herself. She can only walk using the crutch and thus she retains her independence. The gait resembles the adduction model. Internal hip rotation has as well been diagnosed. The muscle tonus is spastically increased on the lower limbs. Flexor contractures have been detected in her hips and knees.

Due to her condition we have decided that she is the perfect candidate for the use of the SWASH orthosis. The decision was influenced by the estimation of the extent of the joint mobility, of her muscle strength, the muscle tonus characteristic, the estimation of the sensibility, of the posture and balance (the estimation of the general strength), the estimation of gait and its mutability and of the functional activities. I intend to focus on the estimation of the girl's gait and its mutability with and without the use of the SWASH orthosis, as this is where the differences were most prominent.

The clinical analysis of the girl's gait with and without the use of the SWASH orthosis proved a bigger disturbance in her lower limbs with typical abnormal motive gait models, for instance the excessive flexion in her knees in the support phase, the increased adduction and inner hip rotation. Due to the equinovarus she can only toe walk. Such abnormal motive gait models in her ankle and foot do not provide her with enough support and stabilization. Thus, she is unable to stretch her knee to the desired position. In the support phase she walks with her knees bent. In the swing phase her knee movement changes according to the flexion or the extension. Without the use of the SWASH orthosis the dynamic control of the asymmetric pelvis and the active and correct posture. On the other hand, it has become clear that the SWASH orthosis enables the upright gait. This is the result of the more stable gait, the increased extension in the knees and hips and the abduction and the outer hip rotation.

Thus, SWASH orthosis prevents the crossing of feet and makes the gait easier.

The estimation of the mutability of her gait was made on the basis of the time measured test of 10 m gait. The girl using stable footwear had two highlighters of a different colour stuck to her heels by adhesive tape (micropor). Thus, I was able to differentiate the left footprint from the right one.
The test was carried out six times: three times without and three times with the application of the SWASH orthosis (5).

RESULTS

The results are the following (Table 1):

The distance of 10 m took the girl 29 seconds without the use of the application of the SWASH orthosis. With the application of it, the same distance took her only 18 seconds. Regarding the fact that the outhouses shortened the time spent for 11 seconds it can be said that the gait speed changed from 0.35 m/s to 0.56 m/s. The gait speed increased the cadence from 68 to 85 steps per minute. This is also the result of the girl's safe gait. On average, the length of the single step when walking with the use of the variable abduction orthosis increased by 7 centimetres. The average length of the double step increased for 14 centimetres. The width of the basic step increased for 10 centimetres. The SWASH orthosis relieves the adductive gait model and it decreases muscle tonus in the pelvic hoop and the lower limbs that has changed. It also contributes to the increased abduction hip span, which enables the improvement of the functional gait ability and the ability of its mutability (5).

Table 1: *The results of the time measured test of 10 m gait and its mutability*

	Gait without the SWASH orthosis	Gait with the SWASH orthosis
Gait time (s)	29	18
Cadence (step/min)	68	85
Gait speed (m/s)	0.35	0.56
Length of single step (m)	0.14	0.21
Length of double step (m)	0.28	0.42
Step width (m)	0.06	0.16

DISCUSSIONS

The term early brain lesion refers to the abnormal basic muscle tonus, the abnormal motive models, which enable the child development and lead to the abnormal posture and movement. Later they can also cause the contractures and deformations. Different therapeutic approaches are used in order to preserve and achieve normal gait models (6). One of such approaches is the right choice of the suitable instruments - orthoses for the improvement of the motive functions. This results in the partial inhibition or even prevention of the primary, abnormal and compensatory motive models that a child would develop. The SWASH orthosis fits into this category (4).

It is necessary that all the experts included in the treatment of children with CP cooperate. The therapists, the nurses, the doctors and other members of medial staff have to cooperate in favour of the child with CP. The child's parents have to take an active part as well. In such a way, a child with CP will be enabled to develop all his or her potentials (5).

CONCLUSION

The use of the SWASH orthosis:
- influences the better quality of the movement patterns with a girl having a spastic diplegy;

- influences the greater gait speed, the cadence, the increased length of the single and double step and the increased step width;
- lessens the danger of the deformations and contractures;
- preserves the central pelvis position and a more upright posture.

The variable abduction SWASH orthosis contributes to the girl's greater independence regarding the movement and doing of the everyday activities.

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