

Effect of Modified Ankle Foot Orthoses (AFO) along with Goal-Oriented Physiotherapy in a Child with Spastic Diplegic Cerebral Palsy—An Interesting Case Report

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Abstract

Cerebral Palsy (CP) is considered as a neurological condition caused by a non-progressive damage or malformation of the brain that occurs during the developmental process. Body movement and muscle synchronization are mainly impaired in children with Cerebral Palsy. Each cerebral palsy case is unique to the person. One person may have complete paralysis and need continuous treatment, while another may have mild movement tremors with partial paralysis but require little assistance. The form and the timing of the injury to the developing brain are the main reasons for such impairments. Orthoses are primarily used to treat the secondary musculoskeletal problems of muscle contracture and bony deformity. In the Present Case report a modified Ankle Foot Orthoses (AFO) is used bilaterally by using an extra malleolar orthosis, medial block to prevent forefoot adduction and an extra strap to prevent navicular drop for a 7-year-old Spastic Diplegic girl child who was in Gross Motor Functional Classification System (GMFCS) grade III. After a 3-month goal-oriented physiotherapy treatment program primarily focusing on gait, we observed decreased Navicular drop, increased ankle stability (Twisting was not seen), improvement in Gait Parameters such as Increased stride length, Cadence and improved gait velocity.

Keywords: Cerebral Palsy, Spasticity, Diplegia, Physiotherapy, Goal Based Therapy, GMFCS, Gait Parameters, Orthoses, AFO.

Introduction

A heterogeneous group of non-progressive motor disorders in the developing brain is cerebral palsy. The definition of CP involves, by convention, brain injuries arising antenatally and postnatally at any point up to the age of 2 years¹. Premature delivery (less than 32 weeks), Intrauterine growth retardation, Intracranial hemorrhage, Birth asphyxia are the most important

causes². Spastic CP is the most common form of CP in which Spastic diplegia is the usually seen type. Spastic diplegia involves lower limbs more than upper limbs caused by thinning of periventricular white matter³.

There are a wide number of studies carried out on implementation and use of orthosis in Spastic CP children, and they show that If it is used properly to solve the pathomechanical problems in gait, any orthosis is beneficial⁴. There are no studies in the literature that clarify any modifications in conventional AFO that can accelerate the recovery. In the present case report we aimed at modifying the conventional AFO to give better results in terms of stability and gait parameters.

Patient Information: Around 3 months back a seven years old girl child visited the department along

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with the mother. She was the first child born at term with normal birth weight through C section. It was done because the meconium aspiration was seen. Soon after delivery child suffered with asphyxia and there was a delay in giving supplemental Oxygen to the newborn. This lead to neonatal seizures, she was in NICU for around 15 days after which she was discharged. Mother noticed tonal changes at around 6 months as baby was not even having any head control. Her all milestones were delayed. She was under Physiotherapy management since past 5.5 years.

Clinical Findings: On examination child did not have any increased tone in upper limbs perhaps they were weak. Lower limbs had increased tone in bilateral adductors (1+), Bilateral plantar flexors (1+). She was in GMFCS level III, her speech was delayed, No obvious behavioral abnormalities, highest functional positions achieved independently was sitting without support and walking with walker. She was able to do bilateral upper limb activities and also mild fine motor activities. No contractures were seen in bilateral upper and lower limbs. Bilateral Feet were in plantar flexed posture without contracture and there was forefoot adduction with collapsed arch and navicular drop. There was twisting in ankle noted bilaterally.

Diagnostic Assessment: Previously child was under treatment in a special school where Physiotherapy, speech therapy and remedial therapy were given. There was no focused physiotherapy treatment with measurable outcomes but the therapy prevented contractures in lower limbs. Parents main concern was gait. On evaluating gait parameters, we focused primarily on Stride length, Cadence and Gait velocity were reduced considerably. Based on findings we diagnosed the child as spastic diplegic. Retrieved literature on improving gait parameters suggests that Goal oriented physiotherapy treatment has significant contribution in improving lower extremity function in children and adolescents with cerebral palsy⁵

Therapeutic Intervention: Prior to the beginning of intervention, we made a note of exaggerated tone of lower limb musculature, Gait parameters such as Stride length, Cadence and Gait velocity. We primarily focused on improving the gait parameters for which we thought we have to improve stability of ankle joint first in order to improve weight bearing and controlled weight shifting. As twisting was noticed in bilateral ankle joints, we have done modifications in AFO. We used extra malleolar

orthoses with medial block to prevent forefoot adduction and also, we have planned to put an extra strap to support the navicular bone and prevent it from drop (Figures 1 & 2). We have followed goal-oriented physiotherapy treatment protocol to improve bilateral gluteal maximus, hip abductors and ankle dorsiflexor strength by using Proprioceptive Neuromuscular Facilitation strategies mainly Dynamic reversals, Rhythmic stabilization and rhythmic initiation⁶.



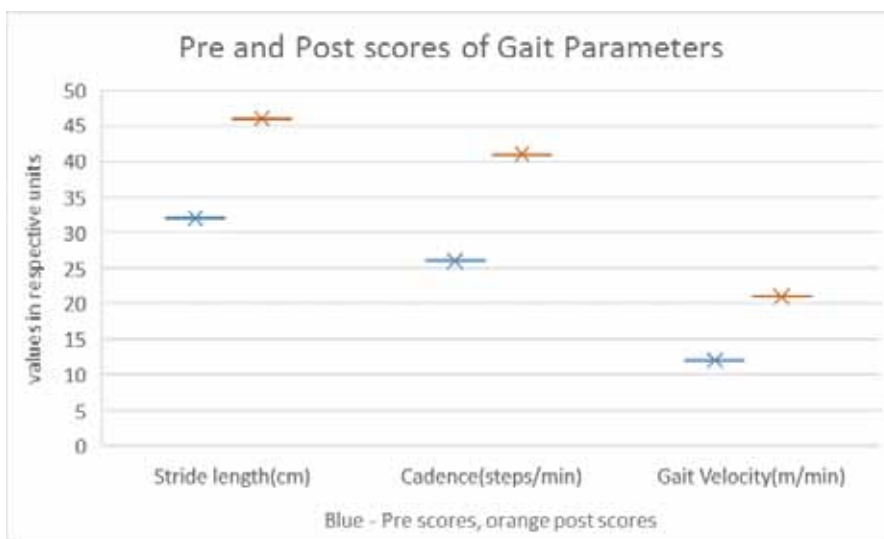
Figure 1: Shows Medial Block



Figure 2: Fitting AFO to the child

Navicular support with external shoe support: Treatment was given one hour a day, 5 days a week for 3 months. AFO was on throughout the treatment session every day. Along with the treatment protocol, home program was taught to the mother by using Mother as a Rehabilitative Aid format⁷. We included Adductor stretching of lower limbs, Single limb stance, Knee thrusting exercises and sit to stand training. All the exercises are done wit AFO on and asked her to show us once before performing at home.

During the study time there were no adverse events. After completion of three months again the readings were taken, there were significant improvements in all the gait parameters(Graph I), we have even found in change of muscle tone. (Table I). There was no change in GMFCS scale.



Graph 1: Shows pre and post scores of gait parameters

Table I. Shows Spasticity measured through Modified Ashworth scale (MAS) on day 1 and after 3 months

Tone (MAS)	Day 1	After 3 months
Bilateral hip Flexors	1+	No hypertonicity
Bilateral hip adductors	1+	1
Bilateral Plantar Flexors	1+	No hypertonicity

Discussion

The goal of the study was to see the effect of modified AFO on the improvement of ankle joint stability and also on gait parameters. This is the first research to record the results of updated AFO after use. An external orthosis should not be used until and unless it is compulsory, as it can be an extra burden for a child. Our previous studies were also focusing on the same⁴. In the way we like, we used AFO for the child and thus avoided an unequal load on the child. We found substantial decreases in forefoot adduction, decreases in muscle tone of plantar flexors, enhanced parameters of gait. Therefore, the results of the study show that stability plays a critical role in achieving regulated mobility. We can boost the prognosis of patients if orthoses are successfully used along with goal-oriented physiotherapy. The rise in gait parameter scores is primarily due to improved stability. To see the success of this regimen on the GMFCS scale, we are maintaining the same protocol for a long-term duration. In the future, we will publish results on GMFCS and Balance. The medial block and additional strap helped in weight transmission and increased efficient toe off

phase. The extra-malleolar orthosis gave an additional stability to ankle joint.

Conclusion

If Orthoses are used cleverly and with proper rationale along with goal-oriented physiotherapy it can give tremendous results and fasten the recovery process of the child.

CARE Guidelines were followed while preparing the manuscript⁸.

Acknowledgement: We would like to thank the child and her parents for their active participation.

Source of Funding: None

Conflict of Interest: Nil

Ethical Clearance: Ethical clearance has been obtained from Second heart Physio foundation Departmental Ethical committee.

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