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Title

Ground reaction ankle-foot orthoses for correction of crouch gait in children with cerebral palsy (Case Study)

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Summary

Floor reaction ankle-foot orthoses are commonly prescribed to improve knee extension of children with cerebral palsy having crouch gait. The objective of this study is to selection of case and prescription criteria for the improvement of crouch gait.

Introduction/ Basics

The Ground Reaction Ankle Foot Orthosis (GRAFO) is a solid orthosis with the primary aim of increasing knee control during stance phase. The GRAFO generally has an anterior pre-tibial shell to increase the proximal lever arm and help control tibial progression through stance phase. As with the solid AFO it is imperative the GRAFO is sufficiently stiff to resist the dorsiflexion moment during mid-late stance phase to ensure it can help influence the position of the Ground Reaction Force in relation to the knee and hip joints. A full length footplate should be used in the GRAFO design to provide the maximum foot lever length thus shifting the GRF as far anterior to the knee as possible during stance phase. The foot plate extends to the toes. The ankle may be set in slight plantar flexion.

Methods/ work process

A total of 25 patients with bilateral spastic cerebral palsy, between 9years to 17 years, with crouch gait. Patients were divided into two groups: good and non-responders with improvement of knee extension during walking, respectively. A multiple predictor analysis was done on parameters that were different between groups.

Implementation

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It is also important to ensure this footplate is sufficiently stiff to resist dorsiflexion during late stance. This can be achieved by ensuring the footplate material is sufficiently stiff and thick, but also by extending the medial and lateral trim lines distally to cover the metatarsal phalangeal joints. Either dynamic (tone) or fixed (contracture) hip or knee flexion contractures of >10 degrees or transverse plane deformities such as excessive femoral and tibial torsion will reduce the effectiveness of the GRAFO at the knee and hip joints due to reduced foot lever length. To ensure optimal function, it is imperative that the GRAFO is aligned or 'tuned' to ensure the GRF is anterior to the knee at mid-late stance to help generate a knee extension moment.

Conclusion

The floor-reaction ankle-foot orthosis is effective in restricting sagittal plane ankle motion during the stance phase of gait in patients with cerebral palsy. As a result, improvements in knee extension and the sagittal plane knee extensor moment in stance phase are achieved

This study showed that gait in patients with low functional level benefit most from ankle-foot orthoses. Unlike in patients with higher functional status, contractures of hip, knee, and ankle did not reduce the positive effects on gait. The suggested prescription criteria may help to better select appropriate patients for orthotics.

References

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