COMPARISON OF CUSTOM POSTERIOR LEAF SPRING AND DYNAMIC CARBON COMPOSITE AFO IN A SUBJECT WITH CHARCOT-MARIE-TOOTH

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INTRODUCTION

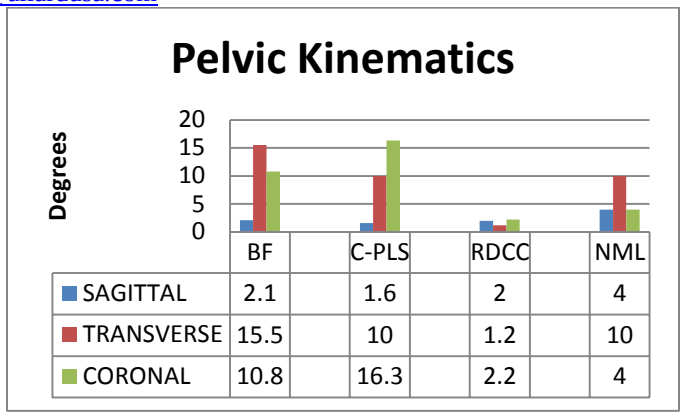
Charcot-Marie-Tooth (CMT) is one of the most common inherited neurological disorders. The neuropathy of CMT is a slowly degenerative process typically resulting in weakness of dorsiflexors, plantarflexors and the intrinsics of the feet. CMT is not considered a fatal disease and people with most forms of CMT have a normal life expectancy however they usually require orthotic intervention, physical therapy and assistive devices to maintain mobility during their lifetime.[2] Orthotic intervention varies from foot orthoses to AFO's based functional deficits. However, there is a lack of research that identifies the most appropriate design for patients with CMT.[1] Identifying maximal functional outcomes is often limited to visual gait analysis and subjective patient commentary and it can be difficult to know if a design change has made a difference to function. The available research studies are all case studies that quantitatively compare the Posterior Leaf Spring (PLS) AFO to other AFO designs.[1,2,3] The more rigid AFO systems tended to improve functional outcomes.[1,2,3] The purpose of this case study is to compare the function of bilateral custom molded PLS (C-PLS) AFO's to bilateral custom fit rigid dynamic carbon composite (RDCC) AFO with an anterior tibial shell in a patient with CMT.

METHODS

A single female patient with a 15 year history of CMT affecting bilateral lower extremities was tested in 3 different conditions: 1) barefoot; 2) bilateral C-PLS, and; 3) custom fit RDCC AFOs. Temporal-spatial and pelvic kinematic data was collected utilizing a BTS G-Walk Portable Gait Analysis System placed at the L5 vertebral level[5]. Speed, cadence, percent of double limb support, and pelvic kinematics were compared across the conditions and to normal values for women.

RESULTS

Speed and cadence improved to normal levels with RDCC and was slowest with C-PLS. Percent of cycle spent in double limb support was lowest but not normal with DRCC and lower with C-PLS as compared to barefoot condition. Pelvic motion was most normal in the RDCC condition however, it was lower than normal in the transverse plane. With the C-PLS and barefoot conditions having increased levels of transverse and coronal motion (Figure 1).



	BF	C-PLS	RDCC	NML
SAGITTAL	2.1	1.6	2	4
TRANSVERSE	15.5	10	1.2	10
CORONAL	10.8	16.3	2.2	4

Figure 1. Pelvic kinematic comparison

DISCUSSION

Comparing objective measured values provides guidance for providing the orthotic design with maxium functionality for the patient. The DRCC orthotic intervention provides the maximum function for this patient with an increase in speed and cadence while decreasing pelvic motion. There is an inverse relationship between coronal and transverse pelvic motion with speed and cadence. The RDCC AFO design incorporates a relatively stiff forefoot, restricting dorsiflexion and includes an anterior tibial shell that provides a mechanism whereby forces caused by loading the toe lever can be comfortably distributed to the leg which appears to normalize gait parameters in this patient model. This study has the obvious limits of a case study and gait parameters measured but can give guidance to practitioners in recommending AFO interventions for patients with CMT. A more rigid design that limits pelvic motion will increase speed and cadence and improve functional outcomes for this patient with CMT.

REFERENCES

1. Burdett RG et al. *JPO* 2004;16:25-30.
2. Bean J et al. *Am J Phys Med Rehabil* 2001; 80:578-582.
3. Del Bianco J et al. *JPO*; 20:155-162.
4. http://www.ninds.nih.gov/disorders/charcot_marie_tooth/detail_charcot_marie_tooth.htm
5. F. Buganéa, et al. Elsevier 2012.

DISCLOSURE

Pamela Hale, CPO is employed by AllardUSA manufacturer of dynamic carbon composite AFOs.

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