INTRODUCTION

‘Tuning’ of segmental kinematics using ankle foot orthosis-footwear combinations (AFO-FC) has been proposed to improve the gait of persons with cerebral palsy and stroke (Owen 2002; Jagadamma et al. 2008, 2009). An AFO-FC consists of a non-articulated AFO in which ankle and shank alignments are considered separately. Modified footwear is used in addition to wedges under the heel to adjust the shank-to-floor angle (SVA), i.e., the position of the lower leg relative to the ground when standing (Owen 2007). ‘Tuning’ of the AFO-FC involves manipulation of the ground reaction force (GRF) relationship to the knee and hip joints to improve gait performance. Although this orthotic approach is being advocated for use in stroke (NHS 2009), limited evidence exists regarding effectiveness. The purpose of this case study was to investigate the effect on gait of a tuned AFO-FC in an individual with post-stroke hemiplegia followed for 6 months.

METHOD

The Northwestern University Institutional Review Board approved this study and informed consent was obtained from the subject prior to participation.

Subject: 56 yr old male (190cm, 88.5kg) who sustained a right (R) stroke in May 2008 with subsequent left (L) hemiplegia, hemi-sensory impairment, aphasia, and impaired motor planning. Five months post-stroke, the subject ambulated with a L articulated AFO with ankle angle of 5º plantar flexion and 10º dorsiflexion of the L knee, 10º plantar flexion with knee hyperextension of the L knee, 14º SVA of (Fig 1). Eleven months post-stroke, the subject presented with passive range of motion of 5º SVA of 14º (Fig 1). Nine months post-stroke, the subject was fit with trunk substitution and circumduction for L lower limb onto the L lower limb, absent terminal stance on the L, modified independence, but had minimal weight bearing in the L AFO-FC with ankle angle of 5º plantar flexion and 10º dorsiflexion of the L knee and pelvis kinematics, ankle kinetics and GRF were also recorded.

RESULTS

Walking speed improved with use of the AFO-FC at 11 months with another increase at 16 months when additional tuning was conducted (Table 1). Speed was maintained with AFO-FC at 17 months. Improvements in knee and pelvis kinematics, ankle kinetics and GRF were all recorded.

DISCUSSION & CONCLUSION

Gait continued to change over time in this subject, so it was not possible to attribute all gait improvements solely to orthotic management. However, since gait was better at 17 months with the AFO-FC than with No AFO and gait with No AFO was the same as with PLS-AFO at 11 months, substantial improvement in gait could be attributed to orthotic management. Additional tuning of the AFO-FC at 16 months based on gait data resulted in further improvements in gait suggesting that tuning is important and can be facilitated by gait analysis.

REFERENCES

NHS QIS. Best Practice Statement - August 2009.
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