Neuroprosthesis for footdrop compared with an ankle-foot orthosis: effects on postural control during walking.

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Abstract

OBJECTIVES: We sought to compare the effects of a radio frequency-controlled neuroprosthesis on gait stability and symmetry to the effects obtained with a standard ankle-foot orthosis (AFO).

METHODS: A total of 15 patients (mean age: 52.2 +/- 3.6 years) with prior chronic hemiparesis resulting from stroke or traumatic brain injury (5.9 +/- 1.5 year) whose walking was impaired by footdrop and regularly used an AFO participated in the study. There was a 4-week adaptation period during which participants increased their daily use of the neuroprosthesis, while using the AFO for the rest of the day. Gait was then assessed in a 6-minute walk while wearing force-sensitive insoles, by using the neuroprosthesis and the AFO in a randomized order. An additional gait assessment was conducted after using the neuroprosthesis for a further 4 weeks. Gait speed and stride time (inverse of cadence) were determined, as were gait asymmetry index and swing time variability.

RESULTS: After the 4-week adaptation period, there were no differences between walking with the neuroprosthesis and walking with the AFO (P > .05). After 8 weeks, there was no significant difference in gait speed, whereas stride time improved from 1.48 +/- 0.21 seconds with the AFO to 1.41 +/- 0.16 seconds with the neuroprosthesis (P < .02). Swing time variability decreased from 5.3 +/- 1.6% with the AFO to 4.3 +/- 1.4% with the neuroprosthesis (P = .01). A gait asymmetry index improved by 15%, from 0.20 +/- 0.09 with the AFO to 0.17 +/- 0.08 with the neuroprosthesis (P < .05).

CONCLUSIONS: Compared with AFO, the studied neuroprosthesis appears to enhance balance control during walking and, thus, more effectively manage footdrop.

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