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Spinal Cord Injury

Functional Electrical Stimulation

Many articles document the effects of FES on gait impairment post spinal cord injury (SCI). Variation in the nature of SCI produces complicated and unique clinical presentations with a great deal of variability in the muscle groups affected. Consequently, most FES studies with this population seek to address deficits in multiple muscle groups and investigate the effects of multi-channel FES systems. There are ten more recent studies in the literature that specifically investigate the use of peroneal nerve FES to alleviate drop foot after SCI.[1-10] Many of the studies within the population of SCI investigate peroneal nerve FES as part of a therapeutic program including other treatment modalities, such as body weight support treadmill training (BWSTT). Only four of the ten studies look at FES as a long-term, neuroprosthetic solution for drop foot.[7-10] One study investigates short-term neuroprosthetic effects of FES, using single session measurements to compare gait performance with FES to that of an AFO.[5] Five of the ten studies involve the therapeutic use of FES and BWSTT combined.[1-4,6] Outcome measures shown to be beneficial for FES in SCI include gait speed, neuroplasticity, gait symmetry and functional mobility including improved foot clearance.

Benefits of FES found in the published research for individuals with SCI include:

Gait Speed

- 10% increase in gait speed with FES alone[5]
- 18% increase when FES was combined with an AFO[5]
- Increased gait speed ranging from 13%[7] to 55%[9] above the AFO at 12 months
- Increases in gait speed ranging from 55%[1] to 84%[3]
- Increases in gait speed of 106% and 158% when FES was combined with body weight support treadmill training (BWSTT)[2,3]
- Significant increase in distance walked during the 2 Minute Walk Test[4]

Neuroplasticity/Therapeutic Effect

- 28% increase in gait speed without FES after 12 months using FES[8]

Gait Symmetry

- Increased step and stride length with FES over ground and with BWSTT[1,6]
- Increased symmetry of swing and stance phase with FES over ground and with BWSTT[1]

Functional Mobility

- Floor clearance during swing was significantly greater with FES than with an AFO[5]
- FES and AFO combined was even more effective for foot clearance[5]
- FES may produce clinically meaningful changes in walking speed which are significant for motor-incomplete SCI[10]

The SCI literature is varied and few studies specifically investigate peroneal nerve FES as a neuroprosthesis. However, the results that are reported provide significant support for this treatment option. A SCI typically results in weakness involving many more muscle groups than just the anterior tibialis muscle. The fact that single channel peroneal nerve FES produces such positive outcomes is a testament to the incredible effectiveness of FES in restoring motor function. Patients with SCI are excellent candidates for FES and the results in the literature support significant functional gains, even with patients who are many years post injury[9].

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