Functional Electrical Stimulation (FES) and Cerebral Palsy – A Review of the Literature

The literature on the use of Peroneal Nerve Functional Electrical Stimulation is scarce. There are 10 articles that utilized any aspect at all of Functional Electrical Stimulation in the study protocols\(^1\)-\(^{12}\). Eleven of those utilized multichannel FES to various LE muscle groups. Only one single case study utilizes Peroneal Nerve Stimulation (PNS) specifically; it compares the effectiveness of surface and percutaneous electrodes\(^1\). Two other studies have a Peroneal Nerve FES component as part of a larger study but the samples are small\(^2,3\).

The studies available emphasize the outcomes of dorsiflexion in swing and dorsiflexion angle at initial contact. The kinematic measures of peak dorsiflexion or mean dorsiflexion during swing are used to look at improvements in the swing phase if gait. Dorsiflexion at initial contact is measured by peak dorsiflexion or the “foot to floor” angle at initial contact.

Outcomes:
Dorsiflexion during swing
Dorsiflexion at initial contact

The single case study\(^1\) comparing electrodes does show an effective increase in dorsiflexion both at initial contact and during swing with both surface and percutaneous electrodes.

Two other studies assigned children to smaller “PNS only” groups within larger studies. In one study\(^2\), eight children were studied under various FES protocols; five received PNS specifically. The results for each child are reported individually making comparisons difficult, but a clear trend toward improved dorsiflexion during swing and at initial contact was shown for the majority of the children. The other study looked at PNS in ten out of a total of 14 children\(^3\). This study also showed that the children receiving FES demonstrated significant improvements in peak dorsiflexion with swing and foot to floor angle at initial contact.

KEY POINTS

Clearly the use of Peroneal Nerve FES alone in children is still rare; most research looks at multichannel systems. Using FES in general is a rather new topic in pediatric gait research. Up to this point most of the electrical stimulation used has been limited to the use of NMES in an exercise type protocol. However there has been a distinct increase in the interest in pediatric FES studies, and several have been initiated using the WalkAide specifically just within the past year.

The literature that does exist for Peroneal Nerve FES and children is promising. The findings are significant for the most part and if not significant have definitely demonstrated positive trends. At the 2010 International Society of Prosthetics and Orthotics meeting a group reported the results of an observational analysis of 124 children, 42 of which had cerebral palsy. Their clinical results are very promising. The use of FES with a pediatric population is likely to become a vital tool to improve gait in the near future. The WalkAide is at the forefront of this paradigm shift and promises to be an exciting part of future therapeutic interventions.
Bibliography


