

## Prosthetics & Orthotics Awareness: Vol.6

By Mitchell Prosthetics & Orthotics – Serving Duncan, Nanaimo, Comox, Powell River, Campbell River

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### **FUNCTIONAL ELECTRICAL STIMULATION – A NEW DEVICE TO TREAT SPASTIC DROP FOOT**

- Spastic Drop foot can now be controlled without using an ankle-foot-orthosis, giving patients another choice other than an AFO
- FES system application has a “neuroprosthetic” effect

Functional Electrical Stimulation (FES) is not a new concept and has been used for rehabilitative purposes for many years. More recently, the advancement in technology surrounding its application for improving the biomechanics of gait has reached a level worthy of clinical interest and benefit.

BIONESS™ (L300) is among several FES systems on the market that apply neuromuscular stimulation to the relevant muscles and nerves that are involved in providing dorsi-flexion and eversion.

In a pathological hemiplegic gait, individuals with spastic drop foot lack the ability to clear their foot in swing due to weak dorsi-flexors and overpowering spastic plantar flexors.

Bioness has solved this by applying a lightweight wireless receiver/stimulation unit around the upper leg. This provides electrical stimulation to the superficial peroneal nerve and the tibialis anterior muscle upon the release of weight after stance and is controlled by using a force sensor switch under the heel in one’s shoe. Rather than dragging the toe in swing phase, the BIONESS unit then provides electrical stimulation to the appropriate anatomy that causes active dorsi-flexion and eversion to occur during the swing phase of gait, thereby eliminating foot drop and compensatory gait deviations like genu recurvatum.

For the first time in decades, orthotists can apply a device that utilizes one’s own neuromuscular activity to treat the spastic deformity, rather than using the external forces of a custom AFO. Designers of this system are labeling this as having a neuroprosthetic effect.

To further the sophistication of this item, the L300 BIONESS unit can be fine tuned to normalize the patients gait on many parameters. Adjustments of the strength, timing of the onset/offset, and ramping of the electrical stimulation are all possible in the hands of the clinician. The unit then becomes customized for the client by the clinician, yet can be slightly tuned by the client after it is dispensed.

Despite minor inconveniences with battery charging and electrode replacement, its use is unparalleled by any other FES intervention for gait correction.



Patient criteria and indications for use are those with spastic drop foot due to an upper motor neuron injury. Pathologies include stroke, cerebral palsy, multiple sclerosis, acquired brain injury, and similar presentations.

This is an exciting advancement in the world of orthotic intervention and rehabilitation in that for the first time, a patient can consider walking more efficiently and safely without the use of an AFO. While the practical and failsafe nature of an AFO cannot be disregarded, for some, departing from its use has been long overdue.