A New Option for Correcting Dropfoot

A new therapeutic concept combining the bracing role of the orthotics discipline with the muscle restoration function of FES (functional electrical stimulation) is now available for patients suffering from dropfoot through a product called the WalkAide.

Dropfoot, the inability to properly lift the forefoot during ambulation, frequently results from interruption of normal signals from the brain to the peroneal nerve, which normally trigger dorsiflexion in swing phase. The condition is a common outcome of multiple sclerosis, cerebral palsy, stroke, traumatic brain injury, and spinal cord injury.

Common manifestations are toe dragging in swing phase and foot slap at the beginning of stance phase as the dorsiflexors are unable to overcome the plantarflexion moment created at heelstrike. Patients with dropfoot often compensate with an exaggerated high-stepping ambulation known as steppage gait.

The WalkAide surmounts dorsiflexor weakness or paralysis by stimulating the peroneal nerve at the appropriate point in the gait cycle to lift the forefoot, assuring ground clearance and providing for a normal heel-to-toe rollover. The result is a more natural, smoother, safer, and more energy-efficient gait.

In recreating the natural nerve-to-muscle response, the WalkAide not only corrects for biomechanical dysfunction but may improve circulation, reduce atrophy and increase joint range of motion. This technology was under development at various research centers for 10 years before recently receiving FDA approval.

The device consists of a battery-operated electrical stimulator, two electrodes and electrode leads packaged into a small case, which is not worn during routine use of the system. Contraindications include lower motor neuron and/or peripheral nerve damage; secondary complications of knee, back or hip surgery; leg trauma; sciatia; peripheral neuropathy; spinal stenosis; post-polio syndrome and Guillain-Barre. The WalkAide should not be used by those wearing a pacemaker or who are subject to seizures.

While probably not the ultimate answer to the control of dropfoot, the WalkAide has the potential to improve gait, overall health, and quality of life for appropriate patients. A physician’s prescription is required.

Orthotics for Managing Cerebral Palsy

Orthotists are frequently involved in the management of young patients with cerebral palsy. United Cerebral Palsy estimates that 764,000 children and adults living in the United States manifest C.P. symptoms and that some 8000 babies and infants and 1100-1500 preschool-age children are newly diagnosed each year. Of these, a majority are affected with spastic diplegia — stiff, permanent contraction of the muscles in both legs. Bracing for C.P. is primarily employed to stretch hypertonic muscles and prevent contractures. Ankle foot orthoses (AFOs), the most frequently prescribed devices for C.P. patients, manage abnormal plantar flexion (equinus deformity) by controlling or eliminating ankle and subtalar motion to prevent contractures and improve gait.

AFOs Bring Unruly Legs Under Control

Ankle-foot orthoses of various designs are widely considered to be an important aid in managing young patients with spastic cerebral palsy; indeed, they are prescribed for C.P. management more than any other orthotic device. The device must include contracture prevention, improved function and ambulation and tone reduction in proximal muscles to improve function at higher levels.

The chief role of the AFO in this application is to limit unwanted ankle and subtalar movement, primarily ankle plantarflexion, and indirectly to affect knee and hip function. Children with spastic C.P. often acquire a dynamic equinus deformity, which prevents them from putting their foot flat and attaining a stable base for stance and walking. Assuming the ankle can be placed in a neutral position at rest, i.e. the deformity is not fixed, a correction can be applied through one of several AFO constructions, depending on the capabilities and goals for the patient.

Reviewing the different types of AFOs that may be appropriate for C.P. patients:

- With a shorter profile

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We gratefully acknowledge the assistance of the following resources used in compiling this issue:

Innovative Neurotronics Inc. • Marta Tankersley Orthomerica Products Inc.

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Choosing the Right AFO for Cerebral Palsy Patients

(Continued from page 1)

Leaf-spring AFO

A leaf-spring AFO helps overcome mild equinus spasticity and can improve ground clearance during ambulation swing phase. It is not normally rigid enough to control stance phase equinus, however. Its low profile and thin foot plate allow it to fit in most shoes, providing improved cosmesis over some other designs.

The solid-ankle AFO, one of the most commonly used designs for the C.P. population, essentially prevents dorsiflexion and plantarflexion as well as varus or valgus deviations of the ankle and hindfoot. It can be designed to hold the ankle in a neutral position or at a predetermined degree of plantarflexion or dorsiflexion depending on the needs of the patient. This design is a primary choice for controlling equinus in both stance and swing phase and for contracture prevention.

Floor Reaction Orthosis (FRO) — This solid-ankle design incorporates a plastic wrap-around, which applies a knee extension moment during stance phase. The FRO can be a welcome improvement over a heavy knee-ankle-foot orthosis for addressing C.P. crouch gait and other sources of knee instability.

Tone-inhibiting characteristics can be built into many of these designs to address hyperactivity in proximal muscles (see accompanying article.)

Donning and wearing an AFO can be a challenge for C.P. patients with deformities, abnormally stretched muscles, pressure-sensitive feet and other tolerance issues. A fabrication option that provides relief in appropriate instances is a two-piece or combination construction featuring a flexible molded inner boot of thin thermoplastic, which wraps around the foot and can be donned separately from, then joined to, the outer AFO. Because the two components are custom-fabricated from the same mold, they fit together intimately and are held snugly in place by closure strap.

Available research is inconclusive on the relative merits of different AFO options, so selection of a particular design is a combination of art and science. However, the value of AFOs for improving locomotion, function in spastic cerebral palsy patients, relative to no orthosis, is well established. Properly prescribed and custom-fabricated AFOs have been shown to increase stride length, reduce energy expenditure, and give patients a more natural look while walking.

When prescribing an AFO for a patient with spasticity, bear in mind that AFOs can prevent or delay development of a deformity, they are not valid for overcoming pre-existing fixed deformities. Therefore, any existing fixed deformities should be corrected by surgery, therapy, serial casting or other means if possible before orthotic application.

In summary, AFOs serve as a positive tool in managing spasticity associated with cerebral palsy. They will delay or prevent development of fixed deformities but not overcome an existing fixed deformity. They can prevent contractures, improve gait parameters, and often give patients a more natural appearance while ambulating.

Our orthotic staff is well prepared to assist in the selection and fabrication of AFOs for C.P. patients. We welcome your inquiries and referrals.

Tone-Inhibiting Designs Enhance AFO Function

Tone-inhibiting features can be built into different AFO designs to accommodate the needs of both children and adults with neuromuscular deficiencies. An approach particularly suited to young C.P. patients is the dynamic AFO (DAFO), so named because its flexible design allows for increased degree of independent motion. This flexible supra-malleolar orthosis can be designed with a custom-contoured soleplate that evokes the desired reflex response. Key to its effectiveness is that it is thinner than any type of AFO, and can be worn under any type of clothing and will fit inside shoes with a wide toe box. They can be rendered in bright colors and finished with popular children’s designs. Assuming the patient does not grow out of them, DAFOs typically need to be replaced after about a year of wear.

Note: The terms “dynamic AFO” and “DAFO” are sometimes associated with a particular company that fabricates finished orthoses from patient molds. Other providers fabricate these devices as well, sometimes under different product names. In using the dynamic AFO and DAFO terms, we are referring to the concept, not a particular company’s product.
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Common manifestations are toe dragging in swing phase and foot slap at the beginning of stance phase as the dorsiflexors are unable to overcome the plantarflexion moment created at heelstrike. Patients with dropfoot often compensate with an exaggerated high-stepping ambulation known as steppe gait.

The WalkAide surmounts dorsiflexor weakness or paralysis by stimulating the peroneal nerve at the appropriate point in the gait cycle to lift the forefoot, assuring ground clearance and providing for a normal heel-to-toe rollover. The result is a more natural, smoother, safer, and more energy-efficient gait.

In recreating the natural nerve-to-muscle response, the WalkAide not only corrects for biomechanical dysfunction but may improve circulation, reduce atrophy and increase joint range of motion. This technology was under development at various research centers for 10 years before recently receiving FDA approval.

The device consists of a battery-operated electrical stimulator, two electrodes and electrode leads packaged into a small case, which is not fixed, a corrective splint and the experience and capabilities of our practice.

The WalkAide is an alternative to the conventional orthotic treatment for dropfoot, an ankle-foot orthosis. AFOs have long been an effective management tool for this condition, but for some patients an FES system may provide an improved gait and be more comfortable to wear and more cosmetically acceptable.

A programmable tilt sensor built into the system analyzes movement of the wearer’s leg and foot and controls stimulation during gait. The device is initially programmed with dedicated software on a laptop computer. Though a heel sensor is used for programming, it is not worn throughout routine use of the system.

Contraindications include lower motor neuron and/or peripheral nerve damage; secondary complications of knee, back or hip surgery; leg trauma; sciatia; peripheral neuropathy; spinal stenosis; post-poliomyelitis syndrome and Guillain-Barré. The WalkAide should not be used by those wearing a pacemaker or who are subject to seizures.

While probably not the ultimate answer to the control of dropfoot, the WalkAide has the potential to improve gait, overall health, and quality of life for appropriate patients. A physician’s prescription is required.

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