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HEALTH

Israeli device aids stroke recovery - at home

By David Brinn April 25, 2005

Suffering a stroke can be severely debilitating, frustrating, and costly. It's the leading cause of long-term disability in the US with current statistics indicating that there are over 4.5 million Americans who have survived a stroke or brain attack and are living with the after-effects. According to the National Stroke Association, only 10% of stroke survivors recover almost completely.

Today, the chances of full stroke recovery and stroke rehabilitation with post-stroke home treatment for paralyzed muscles are being improved with the advanced Israeli-developed training device Biomove 3000 Stroke Rehabilitation system, the first such device specially developed for home therapy after stroke.

Israeli company Curatronic Ltd. announced this month that it has obtained US Food and Drug Administration (FDA) marketing approval for the Biomove 3000. The battery-powered device detects extremely small electrical electromyographic (EMG) signals that persist in paralyzed muscles after a stroke and uses these tiny signals to initiate an electrical stimulation impulse to the muscles, resulting in actual muscle movement by the patient, according to Curatronic CEO Ben Philipson.

"With the Biomove training technology, all you need is a tiny bit of movement left - even a finger or a toe wiggling. That's sufficient for the device to be picked up as an initial signal to stimulate the muscles from the brain," Philipson told ISRAEL21c. "The device is set to deliver stimulation impulses to the same muscle group - thus activating the muscle. The patient only has to invest a tiny bit of effort and the device responds."

This form of stroke rehabilitation and stroke treatment is used to re-learn which part of the brain to activate and to re-develop spontaneous muscle control. This stroke recovery technology, said Philipson, is known as ElectroMyoGraphic triggered NeuroMuscular Electrical Stimulation or EMG triggered NMES.

Muscle movement is caused by electrical impulses originating in the brain, which are transmitted via nerve cells to the muscles. When a person wishes to initiate muscle movement, the brain sends electrical signals to the muscles. Upon arrival of these signals, the muscles respond by contracting. The electrical muscle signals can be measured and they are called electromyographic signals: EMG.

If, due to brain damage caused by a stroke, regular electrical impulses are not generated or they can no longer reach muscles, normal muscle contraction becomes impossible. Although there are mostly minuscule "left over" EMG signals, these are very often extremely small and

unable to control muscles. This often leads to irreversible damage and loss of muscle function, resulting in muscle paralysis, such as "claw" hand or "drop foot" (gait problems), according the Biomove website.

After a stroke, the patient is rehabilitated by physical therapy. Often, it includes Functional Electrical Stimulation (FES) or NeuroMuscular Electrical Stimulation (NMES) in order to avoid muscle spasticity. This is done in the hope that there will be some form of spontaneous recovery and that the muscles will not become too stiff. In most cases, however, spontaneous recovery will not occur and the patient will be left with severe disuse muscle atrophy and paralyzed muscles, greatly affecting the quality of life.

"What often happens is that after a patient suffers a stroke and is hospitalized, the neurologists send them home saying something like ' you'll have to learn to live with it.' They may go through some kind of rehab therapy at a clinic, but most patients with muscle spasticity don't fully recover and they find it incredibly frustrating," said Philipson.

He said that the paralysis of muscles can often be prevented if the patient is offered the possibility to re-learn the use of the affected muscles by improving electrical muscle activity. This goal is achieved by combining EMG measurement and NMES muscle stimulation technologies in the Biomove system.

"Paralyzed muscles aren't really paralyzed - they're just not voluntarily able to contract any more through electrostimulation coming from the brain. But if you apply external electrostimulation, the muscles will move," he explained.

In almost all cases, there is still a very small amount of electricity (EMG) which reaches the muscles. These small "left over" EMG signals are picked up by "stick on" electrodes placed over the paralyzed muscles. The Biomove device then amplifies these small signals and when an internal preset "trigger" level is reached, the built-in electro stimulator returns an electrical stimulation impulse (NMES) to the same muscles. The muscles now respond as originally "instructed" by the patient's own brain signal. This way the patient is able to obtain direct muscle movement, assisted by the Biomove device.

The response to the Biomove has been enthusiastic. Prof. James Stephens of the Physical Therapy Department at Temple University's College of Health Professions tested the device and deemed it the best system he has seen in terms of ease and simplicity of use for the patient.

"My clinical experience suggests, as research is beginning to show, that a system of EMG-triggered electrical stimulation is an effective means of restoring function. I introduce [the Biomove] to my students and hope that they will have it available to use in their clinical work after graduation," he said.

A 49-year-old stroke patient gave a testimonial on Biomove's website that following his stroke, he was frustrated at not being able to walk anymore without dragging his left leg.

"I have found [the Biomove] the best investment I ever made and am very thankful to be able to walk almost normally four months after my stroke," he wrote.

For Philipson, marketing the Biomove is a natural progression in a life devoted to medical technology. He was born in Holland where he studies biomedical electronics. After working for a number of medical device companies there and moving into the sales sphere -"because the sales people didn't really have enough technical background" - he moved to Israel in 1983.

He continued his medical sales path, working first for Mennen Medical and then for Direx medical systems for eight years selling equipment to urologists and opening up the then-burgeoning market in eastern Europe.

"Eventually, I decided it's time to start working for myself, and I founded Curatronics in 2000." Said Philipson.

After first delving into different fields with various therapy equipment, Philipson heard about a technology for stroke rehabilitation for clinical use that was developed 35 years ago by a Danish company. Curatronics adapted the technology into the Biomove device for home use.

"We didn't even think about going out with it in a big way, but it just developed that way," he explained. "There was no device on the market that was inexpensive and geared for patients to use themselves. The initial response to the announcement that we had a device for stroke rehab that existed for patients was so positive that we decided to go for FDA approval."

With the Biomove now available for purchase online, and soon to be available by prescription through doctors and clinics, Philipson is confident that the era of frustration for American stroke victims has passed.

"The Biomove is a low-cost device and very simple to use. It costs under $1200 and it's a unique opportunity for the stroke patient to train themselves inexpensively."