

Tiny bursts of electricity help spinal patients use their hands

By Joseph Hall

February 16, 2011

For Philip Stiles, the ability to lift up a credit card is like grabbing the brass ring.

Paralyzed from the neck down during a fall down his home stairs in 2007, the 58-year-old Oshawa man's most fervent wish is to be able to use his hands again.

"Any little bit of (hand) movement would be so beneficial to my life," says Stiles. "When you can't move very much, every little bit is tremendous."

Now, with the help of groundbreaking new research by Toronto Rehabilitation Institute scientists, Stiles' wish is at hand for many quadriplegics.

"If you invest a bit of time, many quadriplegics can actually . . . recover hand function," says Dr. Milos Popovic, a senior institute scientist.

"It's not going to work 100 per cent. . . but the change is sufficiently profound that you take them from not being able to grasp, or take a shower, to being able to take a shower."

With 40 short, sharp shocks per second to the forearms for 40 one-hour sessions, Popovic's University Ave. team has been able to restore significant hand movement to nine quadriplegics.

About 50 per cent of spinal cord injuries result in quadriplegia — or paralysis from the neck down. But among these patients, some 60 to 70 per cent retain some arm movement, but cannot open or close their hands, Popovic says.

Currently, the best anyone can do for these patients is to implant electrodes directly into the muscles that control finger movements. Using their heads or shoulders, the patients then press a current controlling button to open or close their hands.

"But what we have actually discovered . . . is that when you apply this electrical stimulation on the muscles, for a certain number of sessions, these people recover their voluntary hand function," Popovic says.

In Functional Electrical Stimulation (FES), electrodes are attached to the skin above the forearm muscles that help fingers and thumbs hold things.

Patients are then told to perform specific tasks that would involve those functions, such as picking up a cup. After the patient imagines but fails to do the task for several seconds, the electrodes fire in sequences and intensities that generate the required hand movement.

Spinal injuries cause paralysis because they block electrical impulses from the part of the brain that controls a desired movement to the part of the body you want to use. But the injury blockages are rarely complete. Some tiny bursts of electricity can find their way through, Popovic says.

Popovic's research appeared this week in the journal *Neurorehabilitation and Neural Repair*. The nine patients in the stimulus group received the treatment within six months of their injuries. Popovic is now investigating whether stimulus given to people with older injuries can have similar effects.

That research includes Stiles, whose arm and hand movement are so weak that a piece of paper tests the limits of his grip.

After going through the 40 initial sessions, Stiles can now lift up a credit card, which he counts as a major improvement. He'll continue the therapy at home with a portable electrode apparatus that he'll use with video game technology.

Popovic also plans to study whether the FES technique can help people regain leg movement.

"FES (stimulation therapy) has the potential to have a significant and positive impact on the lives of individuals living with the devastating results of spinal cord injury," Dr. Anthony Burns, Medical Director of Toronto Rehab's spinal cord rehabilitation program said in a media release.

Burns called the trial "groundbreaking."