Brain Science: Magic or not, this wand helps stroke victims

Magnetic stimulation helps kick damaged parts of the brain into gear. 'It woke me up,' one patient says

BY RANDY SHORE, VANCOUVER SUN DECEMBER 28, 2009

Behavioural neuroscientist Lara Boyd uses the transcranial magnetic stimulation wand on a patient at the Brain Research Centre. 'We think after the intervention, moving around is easier, so [patients] move more and if they exercise more they sleep better,' she says. explained. "You can see how these things all just feed into each other, breaking those negative cycles."

Photograph by: UBC public affairs, Vancouver Sun

John Oltoff still has trouble walking or holding a cup of coffee after suffering a stroke that essentially paralysed the left side of his body three years ago.

But he's making great strides with the help of an experimental deep-brain stimulation technique being pioneered by behavioural neuroscientist Lara Boyd,an assistant professor at the University of BC and researcher at the Brain Research Centre.

"It's not a magic wand," Boyd says. But the results can be dramatic.

Boyd aims electromagnetic energy into the brain, exciting the neurons to stimulate the brain into rewiring itself.

The new therapy is a ray of hope for people struck by a condition with few effective options for treatment.

Caused by an interruption of the blood supply to a part of the brain, stroke is the third leading cause of death in Canada and the leading cause of disability. About 300,000 Canadians are living with the effects of a stroke-induced injury to the brain and 16,000 die each year.

“It’s quite startling to see an image of a stroke,” Boyd said. “It really is like a big black hole in the brain.”

Deprived of oxygen, the brain cells die, leaving a lesion in the brain. The resulting injury sends the healthy parts of the brain into overdrive as they try to take on new functions and actively suppress activity in the damaged parts, delaying or preventing recovery.

“That is a real problem for people with stroke who already have trouble moving,” Boyd said. “It’s made even worse by the inhibition that is being placed on the stroke-affected side of the brain.”

It is in that dark place that many stroke victims find themselves: depressed, unable to move around or feed themselves.

At first Oltoff, who was 65 at the time of his stroke, couldn’t move his left leg or left arm.

He was working in the yard when he was overcome.

“I became very dizzy and knew that I had to get on all fours,” he said. “What was scary was when I couldn’t get back up.”

A neighbour recognized that Oltoff was having a stroke and told the 911 dispatcher, who sent paramedics.

Oltoff was at the hospital 15 minutes later to start a long recovery.

“It’s a terrible experience to find out that you can’t move,” he said. Like all stroke patients Oltoff began to relearn the basics: how to pour a glass of water, how to fold a towel, how to walk.

“They used to say what you have [in ability] after six months is what you are going to end up with,” Oltoff said. “But that’s not true; there are constant little improvements.”

Driving Oltoff’s improvement is Boyd’s experimental transcranial magnetic stimulation, her so-called magic wand.

TMS is being tested in two ways, either to stimulate neural activity in the area of stroke damage or to coax the healthy side of the brain to slacken its natural tendency to suppress activity on the damaged side.

Oltoff is receiving the latter treatment in Boyd’s study.

To excite the brain the TMS is set to a higher frequency, about five pulses per second, which causes production of a chemical that the brain uses to raise excitation called glutamate. To slow neural activity they run at one pulse per second, which stimulates another neurotransmitter associated with suppressed brain activity, called GABA.

“In effect we turned down the healthy side’s ability to inhibit the damaged side,” Boyd explained.

After the brain stimulation, the brain is “primed” to learn new things. Boyd combines TMS with physical therapy, telling the brain what abilities to rewire with that newfound energy. The window of neural excitation lasts from 30 to 60 minutes.

Combining TMS with physical therapy amplifies the effectiveness of the therapy.

Oltoff has made significant progress on rehabilitating his left hand using the combination, Boyd said. And Oltoff is a fan.

“It speeded me up about 25 per cent, which is phenomenal,” he said.

“I’m delighted that I participated.”

Not only did the deep-brain stimulation turbo-charge Oltoff’s physical therapy, it roused him from a cloudy slumber.

“It woke me up,” he said. “After my stroke time changed, time wasn’t what it used to be, a day would fly by and it wouldn’t register as a day.”

It was as if a part of his brain that had been asleep was switched on. “Time began to mean something again,” he said.

Patients often say they feel generally better and more alert after TMS, Boyd said. It is being tested as a treatment of last recourse for depression.

Boyd is also studying the TMS afterglow, monitoring patients after treatment for several days to see if they move around more.

“We think after the intervention, moving around is easier, so they move more and if they exercise more they sleep better,” she explained. “You can see how these things all just feed into each other, breaking those negative cycles.”

More effective therapy is a boon to patients, but for Oltoff, and the hundreds of thousands of people in Canada recovering from stroke, the fight will never be over.

“You can never stop working at it,” he said. “If you sit, you are doomed.”

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