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HEALTH

Lab zaps strokes with magnetic pulses

Scientists hope experimental techniques may offer new tools

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NEW YORK (AP) -- Mickey Poduje, 50, had been out all day with her husband Noel on their 32-foot (9.6-meter) motorboat off the Massachusetts coast. When they returned to the dock, she climbed out to do her usual job of securing the lines. Then she collapsed.

It was a stroke. A blood vessel had burst in her brain, paralyzing her right side and leaving her mute at first. At the rehabilitation hospital she just mostly said "when ... when ... when" over and over again.

Six months later, Mickey could say a few individual words, but doctors said her speech wouldn't get much better. "People were saying, what you see is what you get," Noel recalled.

They were wrong. Six years after that horrible day at the dock in 1996, Mickey Poduje (pronounced "poh-DOO-yay") entered a Boston laboratory and had a metal device the shape of a figure-8 pressed to her right temple. It sent magnetic pulses into her brain. And the result, published just this year, is that her speech did improve slightly.

It's one of a handful of recent experiments in stroke patients that sound like the fantastic promises of an old traveling medicine show. Improving speech by zapping the brain with magnetism? Making weakened limbs work better by putting coils on the head and releasing current so weak it could come from a battery?

Those ideas have spurred interest in a handful of laboratories in the United States and abroad. The few preliminary results produced so far are not cures. They are more intriguing than life-changing. But scientists hope that with further refinement,



Dr. Alvaro Pascual-Leone puts a magnetic device on Mickey Poduje's head.

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the techniques could provide new tools for treating strokes.

Take the magnetic approach, called repetitive transcranial magnetic stimulation or rTMS, which involves sending tightly focused magnetic pulses into the brain.

"A lot of us believe that this is really going to be a turning point in intervention in neuroscience," said Dr. Randall Benson of Wayne State University and the Detroit Medical Center.

While doctors have already shown that implanting electrodes in the brain to deliver stimulation can help control tremors, he said, rTMS offers a way to stimulate brain circuits without surgery.

Benson is just starting a study of using the magnetic stimulation to improve stroke-related language impairment, but in a different way from the approach tested with Mickey Poduje. British researchers, meanwhile, are beginning studies to see whether it can help stroke patients overcome problems with swallowing or using a weakened and clumsy hand.

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— Dr. Randall Benson of Wayne State University and the Detroit Medical Center

Mickey Poduje's problem, called nonfluent aphasia, shows up to some extent in more than a third of stroke patients, though most recover to some degree. Their speech is hesitant, broken up and poorly articulated. They have trouble coming up with words they want to say, especially verbs. So they often have trouble communicating their needs.

"They almost talk like a telegram," said Margaret Naeser of the Boston University neurology department and the Veterans

Affairs Healthcare System in Boston, principal investigator of the federally funded rTMS research project that included Poduje.

She thought of trying magnetic stimulation because MRI brain scans showed that in aphasia patients with a stroke in the left side of the brain, an area on the right side became over-active when the patients tried to describe a picture. Could this be interfering with the brain's attempts to find a word? She approached Dr. Alvaro Pascual-Leone, an rTMS expert at Harvard Medical School, because she knew magnetic stimulation can paradoxically be used to calm brain circuits. They launched a study together.

Poduje was one of four patients in the study, all of whom had suffered a stroke at least five years earlier. Researchers focused on their ability to look at drawings of common things like a hammer, cup or a tree, and say what they were seeing.

For the experimental treatment, the researchers pressed an electromagnetic coil to the right temples of their patients, near the over-active brain area, and applied magnetic pulses for 20 minutes, five days a week, for two weeks.

That brought surprisingly durable results. Poduje, for example, went from being able to name what she was seeing in only four out of 20 drawings before the experiment to seven by two months later, and 12 by eight months afterward.

As a group, the four patients showed significant continuing improvement two months and even eight months after the magnetic treatments ended. The patients told the researchers they noticed it was easier to name the pictures. They also showed improvement in their spontaneous speech after the treatments.

Poduje, now 59, said in a brief telephone interview recently at her home in Needham Heights, Massachusetts, that the treatment helped her. Asked if it was easier to remember words, she replied, "little."

She improved enough after the experiment to become eligible for a speech therapy program that focused on improving speech output.

Noel Poduje accepts the laboratory documentation that his wife got better, but says Mickey's speech had been improving anyway, and that he didn't notice any dramatic effect in her everyday speech from the magnetic stimulation itself.

He never saw the experiment as anything more than research that might help somebody down the road, he said. Poduje said that while his wife's speech continues to improve, it remains markedly impaired. She says single words or strings a noun and a verb together, he said.

The continued improvement shown by patients on the picture-naming tests even eight months after the treatments was a surprise, Pascual-Leone said.

It "suggests we are opening up the possibility for the brain to establish and implement a new strategy to gain access to language," he said. He suspects the brain-circuitry suppression brought on by the magnetic stimulation is helping the brain abandon fruitless strategies to regain its language abilities, and explore new ones.

Naeser, who is continuing the research, said she suspects rTMS would help most when paired with speech therapy, rather than used by itself as in the preliminary experiment.

'On the right track'

"I guess we could say we're on the right track, but we haven't cured aphasia," Naeser said.

Martha Taylor Sarno, an aphasia expert and professor of rehabilitation medicine at the New York University School of Medicine, called Naeser's results fascinating. "Anything that suggests recovery is interesting because so little is out there that can provide any significant difference in performance in people with chronic aphasia," she said.

At a National Institutes of Health lab in Bethesda, Maryland, meanwhile, researchers have found that sending a weak electric current into the brain can make stroke patients slightly more nimble with a weakened limb.

That happened with six patients whose upper arms had been weakened by a stroke two or more years before. They practiced a series of simple tasks -- things like turning over cards, picking up beans with a spoon and stacking checkers -- until they were doing them as fast as possible.

Then researchers put one electrode on their foreheads and another on top of their heads, and either ran a weak current between the electrodes or merely pretended to for 20 minutes. The study participants repeated the series of tasks, both during the stimulation and afterwards.

When subjected to real current, or within about 25 minutes of getting real current, every patient completed the tasks slightly faster than at other times. They shaved an average of about four seconds off a performance that normally took about 44 seconds.

That's not much, concedes Dr. Leonardo Cohen, who did the work with colleague Dr. Friedhelm Hummel. But it resulted from just a single treatment, not combined with any kind of training regimen, in patients who had suffered their strokes long before, Cohen said.

He said he expects that if such treatments are given repeatedly, paired with training in people just after their strokes, "we will be able to go much further."

It's not clear why the weak current helped the stroke patients perform, he said. But it appears to prime the part of the brain that's going to be called on, like giving it "a little bit of a cup of coffee," he said.

In any case, Cohen's lab has started working with a rehabilitation hospital to see if the brain stimulation can help when paired with standard treatments just after a stroke.

"I want to see it working in the regular rehabilitation environment," Cohen said. "If it does there, then we may have something important in hand."

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