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Magnets offering jolt out of dark

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Once a week, Lucinda Smith tucks earplugs into both ears, flips her auburn hair over a neck rest and waits for a powerful magnetic burst to be aimed at her skull.

The magnet's jolts arrive with a rattle, like a woodpecker drilling into a tree. Timed and positioned just right, they could chase away the depression that has darkened her life.

"I climb out of the well every day," said Smith of Sacramento, a former teacher who has struggled with depressive episodes since childhood. She marks good days with small accomplishments – going grocery shopping or taking her dog for a walk. On bad days, she doesn't leave home.

She has come to the UC Davis Center for Mind and Brain, in an office park in east Davis, to take part in a pilot study into whether a newly approved treatment for depression might also help people with bipolar disorder.

"We've encountered this huge new territory, and we've just walked a few steps in," said Dr. Gouhua Xia, a UC Davis professor studying repetitive transcranial magnetic stimulation, or TMS.

About 14 million Americans in a given year are affected by some form of depression, according to the National Institute of Mental Health.

Researchers have known for years that powerful, pulsed magnets can create electrical fields in the brain, speeding up or slowing down neuronal activity depending on where and how they are aimed.

The effect has been studied as a potential treatment for stroke, brain injuries, chronic pain, migraines and a wide range of psychiatric disorders.

So far, its use for depression is farthest along, with the federal Food and Drug Administration in October approving TMS for people who haven't been helped by the first medication they are prescribed.

The treatment could be available in California early next year, according to Neuronetics, the

Pennsylvania company whose Neurostar TMS equipment now has FDA approval.

"The intriguing thing about it is it's noninvasive. That's the biggest appeal," said Dr. Jaimie Henderson, a Stanford neurosurgeon who is president of the North American Neuromodulation Society.

TMS can feel like a dull tapping or thumping, not painful, but sometimes a little startling at first. Unlike medications, it doesn't cause sleepiness, weight gain or other systemic side effects. And unlike electric shocks now more commonly called electroconvulsive therapy, it doesn't cause confusion or memory loss.

Still, TMS has one thing in common with just about anything else that doctors can throw at depression – it only works for some people. In different studies, it has helped as few as 20 percent to more than 60 percent of those who try it.

"We have a lot left to learn about which specific kinds of depression respond to TMS," said Dr. Joshua Rosenow, a neurosurgeon at Northwestern University in Chicago studying TMS as a way to help reactivate brains after serious injury.

TMS also requires lots of time and careful placement.

"The effect is very dependent on who is delivering the TMS," Rosenow said. "The way you hold the coil, where you put it, the rotation, the angle" affect what happens in the brain.

Doctors still don't know which intensities and sequences of pulses will help most, Xia said, and are just now working through issues of frequency and duration.

For depression, a common approach has involved giving people a series of magnetic jolts every weekday for four to six weeks, with each patient's visit taking 20 to 40 minutes. The benefit seems to last only a few weeks before follow-up sessions are needed.

"For about a month I did great," said C. Hensley, another subject in Xia's study. She asked that only her first initial be used because she doesn't want her children to have to deal with the stigma some still place on people with bipolar disorders.

Hensley was diagnosed bipolar in her 20s. In two decades she has been treated with a variety of antidepressants, antipsychotics and anticonvulsants.

"They put together cocktails, cursed cocktails," she said. "I'd say 99 percent of them have some type of side effect, whether you're exhausted or nauseated or just not yourself.

"The medicines take away half of your life."

With TMS, there is no blunting of her energy or creativity, she said. Despite the long drive from her Placer County home to Davis for repeated sessions, "I would take it over any medicine you could give me."

She will soon start weekly follow-up sessions as part of the study. Like many other participants, Hensley and Smith found Xia through Internet searches, after reading about promising research elsewhere.

The treatment has nothing in common with so-called magnetic "cures" to ease aches and pains. Those stable magnets exert a constant pull on metal objects, and have no proven effects on human health.

Electromagnets like those used in TMS can be switched off and on rapidly. The pulsing is what generates the electrical field that affects nerve cells.

Despite the FDA approval, insurers are unlikely to pay for TMS treatment right away, said Dr. Mark Demitrack, chief medical officer of Neuronetics. He declined to speculate about how much it will cost.

Meanwhile, Neuralieve, a Bay Area company, is seeking federal approval for a handheld TMS device that people with migraines could use when they start seeing light flashes or visual distortions that can precede an episode.

That device helped nearly 40 percent of those who used it in a study, compared to 22 percent who were given a sham device that clacked and vibrated in about the same way but delivered no magnetic pulse.

Dr. Yousef Mohammad, the Ohio State neurologist who conducted that study, is an adviser to Neuralieve. He's also researching TMS' potential for treating severe facial pain.

"What we're doing now with TMS is treating electricity with electricity," he said.

Whether for stroke or depression or pain, TMS is part of a broader trend that goes beyond regulating the brain primarily with medications that affect chemical exchanges between cells.

There are now implanted electrodes, magnetic pulses and even research in animals into switching off and on certain cells with light signals. New imaging technologies have given doctors a clearer view of how the brain is wired.

More and more, the brain is being seen as "a millisecond-scale information processing system," Dr. Karl Deisseroth, a Stanford bioengineering professor, said at recent Bay Area science conference.

In psychiatric diseases when certain brain cells malfunction, "it's fundamentally an engineering problem," Deisseroth said.

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