

HEALTH NEWS

New ultrasound treatment stops essential tremors

Follow the remarkable improvement of one man with palsy after undergoing noninvasive procedure



— MRI technicians Leonard Valentine and Andy Hebel at the at the University of Maryland Medical Center check on patient Tim Dobbyn as he undergoes focused ultrasound treatment for essential tremor on Jan. 18, 2018 *Maggie Fox / NBC News*

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By Maggie Fox

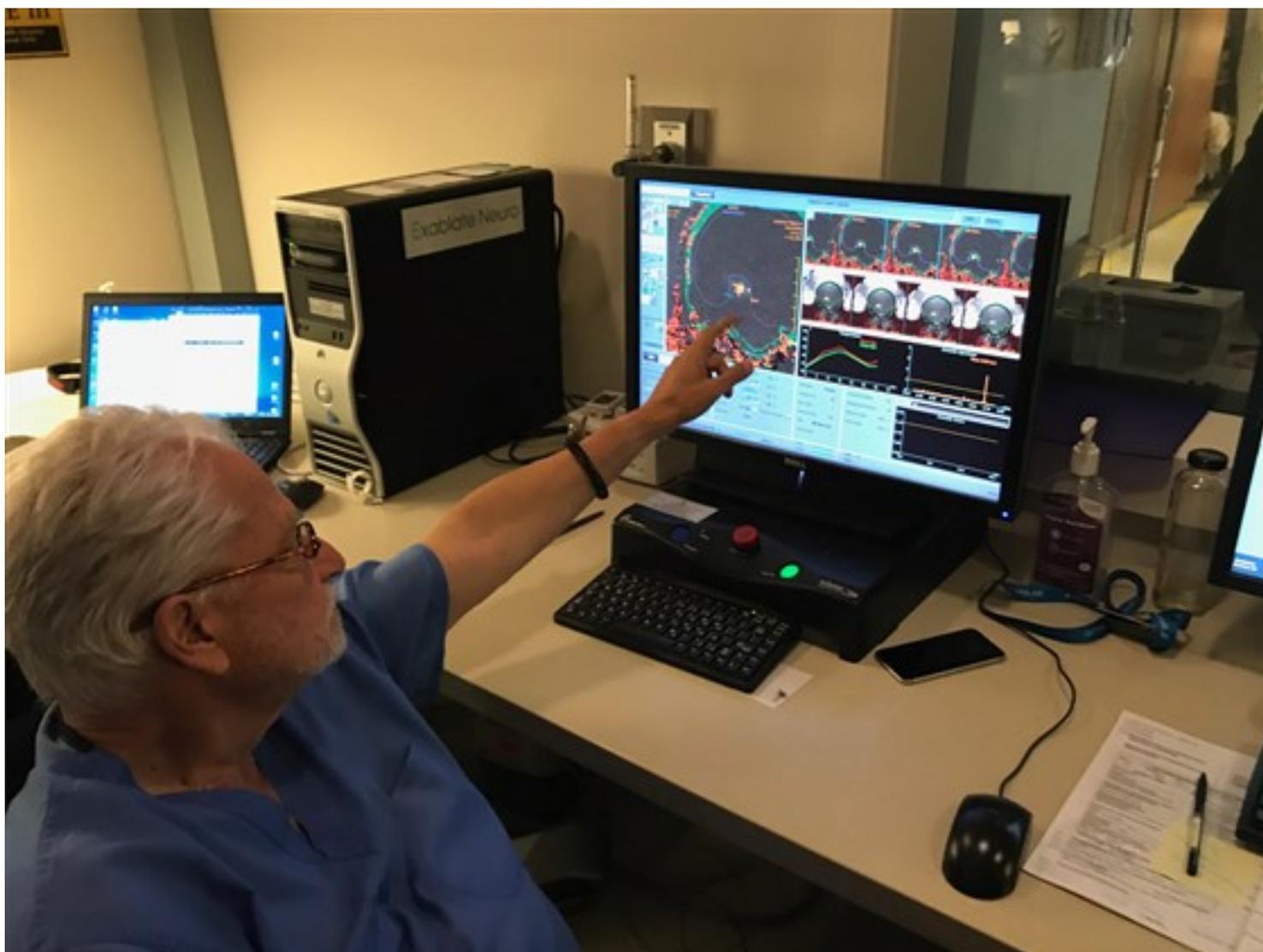
BALTIMORE – It's not often you pay someone to damage your brain.

But Tim Dobbyn, a writer, will have a tiny hole burned in his brain to see if it can help the constant palsy that's made it hard for him to work, cook and even to drink a glass of water without using both hands.

"It makes people extremely nervous to watch me in the kitchen," said Dobbyn, 60.

On a snowy January day, Dobbyn is sitting in an interventional radiology lab at the University of Maryland Medical Center, having a complicated head frame screwed tightly onto his skull.

The tremors began when Dobbyn was 9 years old, and have become steadily worse. Tired of being unable to drink wine without threatening the carpet, or to eat at a buffet without panicking his kids, Dobbyn is about to have a newly approved treatment called focused ultrasound thalamotomy.



— Dr. Howard Eisenberg, professor of neurosurgery at the University of Maryland Medical Center, checks MRI scans of patient Tim Dobbyn's brain as he undergoes focused ultrasound treatment for essential tremor on

“We’re actually burning a hole in the brain,” says Dr. Howard Eisenberg, professor of neurosurgery at the University of Maryland School of Medicine.

A beam into the brain

Ultrasound is usually a benign process, used to image developing babies in the womb, or to look for breast tumors after a suspicious-looking x-ray. But those imaging approaches use a single diffuse beam.

Focused ultrasound sends as many as 1,000 precisely targeted beams converging on a single point. The additive effects can heat and even destroy tissue.

“What do you most want to do?” Dr. Eisenberg asks. Dobbyn answers instantly: “To drink without having to use both hands.”

By sending each beam from a different direction, it’s possible to get deep into the body without damaging the bone, tissue or nerves that lie in the way. In Dobbyn’s case, the target is a little area of tissue about the size of a pencil eraser deep in a brain region known as the thalamus.

The hope is that destroying a little bit of brain tissue will stop the essential tremor in Dobbyn’s left hand and arm. The left-handed Dobbyn, who is a writer, has noticed the tremor getting progressively worse, interfering with his ability to type, use a computer mouse or even brush his teeth.

“What do you most want to do?” Eisenberg asks, as he fits the frame onto Dobbyn’s head.

Dobbyn answers instantly: “To drink without having to use both hands.”

Essential tremor affects anywhere between 5 and 10 million Americans. It’s the most common movement disorder, and it’s mostly genetic in origin. Perhaps the best-known essential tremor patient was actor Katharine Hepburn.

Drugs such as beta-blockers help – for a while. They helped Dobbyn for years, but the tremor outpaced the drug’s ability to calm the movement.

Deep brain stimulation can also help, but requires cutting. The Food and Drug Administration's approval for the noninvasive focused ultrasound came after Eisenberg and colleagues tested 76 patients and found the intervention significantly reduced their shaking.

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“The mean score for hand tremor improved by 47 percent at three months,” they wrote in a [report published in the New England Journal of Medicine](#).

Dobbyn will be positioned in a magnetic resonance imaging machine for the procedure, which could last two hours or longer. The entire apparatus includes an MRI and the focused ultrasound device, made by an Israeli company called Insightec. It was approved by the FDA [to treat essential tremor in 2016](#).

His head must be held absolutely still – thus the frame. “We have to position his head very precisely,” Eisenberg said.

— MRI technicians Leonard Valentine and Andy Hebel at the at the University of Maryland Medical Center check on patient Tim Dobbyn as he undergoes focused ultrasound treatment for essential tremor on Jan. 18, 2018 [Maggie Fox / NBC News](#)

The MRI will help the team see Dobbyn’s brain as they send the ultrasound beams. MRIs can record tissue temperature, and the beams are going to heat the brain tissue, taking it from a normal 98.6 F to a target of 130 to 140 degrees.

In the first of a series of tests, Dobbyn writes on a sheet of paper, trying to trace a spiral. His attempt is so wobbly that it looks like random scribble.

The treatment process begins

The procedure takes a big team, the equipment requires extensive training, and there's little margin of error. In the control room are: Eisenberg; clinical research manager Charlene Aldrich; neurobiologist Dr. Paul Fishman; MRI technicians Leonard Valentine and Andy Hebel; and Nate Kelm, a representative of Insightec. Registered nurse Pam Janocha watches Dobbyn's vital signs.

First, the team will warm the brain tissue a little. Warming brain cells will affect their function temporarily, and the team will know whether they are at the right spot. Dobbyn can tell them what he's feeling, and they can adjust accordingly.

— MRI technicians Leonard Valentine and Andy Hebel at the at the University of Maryland Medical Center check on patient Tim Dobbyn as he undergoes focused ultrasound treatment for essential tremor on Jan. 18, 2018 *Maggie Fox / NBC News*

"We have to make sure he has normal sensation in his hand," Fishman said. "We are making a brain injury."

They dose and check; dose and check.

In the brain's layout, body parts closer to the core are controlled by clusters of neurons closer to the brain's midline, while outlying parts, such as feet and hand, correlate to neurons farther away.

"The three most important things in neurology are just like the three most important things in real estate: location, location, location," Fishman said.

After one of the first pulses of ultrasound, Dobbyn feels a sensation in his hand. They zap him again. After another round, Dobbyn feels something on his tongue. A common side-effect is a type of numbness or tingling.

"It's like when you test a 9-volt battery with your tongue," he said.

Fishman and Eisenberg back off from that area.

“**The three most important things in neurology are just like the three most important things in real estate: location, location, location.**”

After each zap, Dobbyn is pulled out of the MRI, questioned, and often asked to write on the paper again. Each paper is hung on the wall, like an elementary school student’s art work. The scribbles are getting steadily neater.

Any unwanted tingling should go away quickly. It’s not until the tissue is intensively heated that the effects are permanent. There is risk – the target area is very close to areas that could damage Dobbyn’s sensation, his strength or his balance.

An hour in, the tremors are clearly diminishing.

The key is to heat the brain tissue to a high enough temperature for long enough. Once the team members are sure they have the right spot, they can send in a more intense blast of ultrasound and permanently kill the brain tissue.

Hope for patients with brain conditions

Eisenberg and Fishman want to try this approach to treat a number of brain conditions, including Parkinson’s. As with essential tremor, deep brain stimulation can help the tremors and the other effects of [Parkinson’s, which affects about 1 million Americans](#).

The hope is that focused ultrasound can, too. While some doctors might want it to treat hard-to-reach brain tumors, also, Fishman says that’s not safe. “Brain tumors are filled with abnormal blood vessels,” Fishman said. Treatment can cause fatal bleeding.

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But the focused ultrasound can be used to open the blood-brain barrier, helping chemotherapy more easily reach a tumor, he said.

Other groups are trying different approaches to get into the brain without damaging healthy tissue. One team at MIT has figured out how to send [electrical signals into the brain](#) by using wave interference to get the precise frequency they want to a specific target.

— Tim Dobbyn drinks a bottle of water using his left hand only after undergoing focused ultrasound treatment for his essential tremor at the University of Maryland Medical Center Maggie Fox / NBC News

Two hours in, Dobbyn 's mouth is dry and he has a headache. How dense or porous the skull is affects how well the beams can get through and Dobbyn's skull is absorbing the ultrasound beams more than is optimal.

“His skull is absorbing more energy,” Hebel says. That makes the skull heat up, so they wait 10-12 minutes in between zaps.

They've now done all they can do safely and Dobbyn is pulled out of the MRI. He's woozy and needs help standing, but his voice is strong. And his left hand is steady.

He drinks some water, one-handed, from a bottle. “That was sensational,” Dobbyn said.

He holds up the water bottle and waves at his wife as she comes into the recovery room.

“The difference between the two sides is extraordinary,” said Dobbyn’s wife, Sheila.

Dobbyn will go home in a few hours. It will take weeks to know whether the treatment has had a long-lasting benefit, or lingering bad side effects.

A scary few days, then 'rock steady'

A few days later, Dobbyn's left hand is steady, but he does have some problems.

“My walking gait is rather off, but improving with activity. Both my left arm and left leg are prone to making rather extreme movements, thought to be the result of muscles no longer opposing each other to reduce the tremor,” he said.

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For days, he worries whether he will ever walk normally again. In the first 24 hour, he falls twice and his left leg buckles. Because the treatment and the real-time testing are done while the patient is prone, it's not easy to check and see if the legs are being affected.

Not only was the treatment grueling and frightening, but Dobbyn has paid for it out of pocket. Although the device is FDA-approved, health insurance companies don't pay for it yet. It cost Dobbyn \$25,000 to have one side of his body treated and there's no refund if the effects wear off or if the side effects become permanent.

Five day after, Dobbyn is still limping. But by Jan. 28 –11 days after treatment – Dobbyn is walking at a moderate pace and feeling more confident.

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"My maneuverability around the house is greatly improved," he said. "I no longer feel like I just traded one disability for another."

He can hold a wine glass by the stem, sipping confidently.

“The left hand is just rock steady,” Dobbyn said.

The improvement is so profound that he struggles to reconcile a steady left hand with his still tremulous right hand. The treatment only affected one side of the brain, and thus only one side of the body.

By Jan. 31, Dobbyn said he's “a very happy camper” and walking normally.

A week later, the improvements are holding.

“No problems riding a bicycle and I can confidently drive stick shift, so I have good left foot clutch control,” Dobbyn reported. “No sign of tremor in my left hand. Remarkable.”

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