Medical Xpress

Researchers use innovative dual-target deep brain stimulation approach to treat patients with OCD and Tourette Syndrome

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Up to two-thirds of patients with Tourette syndrome (TS), a tic disorder characterized by sudden uncontrollable physical movements, also suffer

from obsessive-compulsive disorder (OCD), a psychiatric condition characterized by intrusive thoughts and repetitive behaviors. Unfortunately, many of these dual-diagnosis patients are resistant to conventional treatments such as medications or behavioral therapy. While deep brain stimulation (DBS) has been approved for compassionate use by the U.S. Food and Drug Administration for OCD, this promising procedure is under investigational use for TS.

Dr. Sameer Sheth, Dr. Wayne Goodman, Dr. Steven Bellows, and their colleagues at the Jan and Dan Duncan Neurological Research Institute (Duncan NRI) at Texas Children's Hospital and Baylor College of Medicine, have recently demonstrated favorable outcomes using a new DBS approach that targets two distinct brain regions to simultaneously treat OCD and TS. The study, published in *Biological Psychiatry*, not only demonstrated the feasibility and effectiveness of using dual-target DBS to simultaneously treat these disorders but also advances understanding of the functional bases of these complex neuropsychological conditions.

"It is challenging to treat severely affected dual-diagnosis patients, many of whom do not respond to current treatments. Unfortunately, several previous attempts at using standard DBS approaches focused on a single brain target have failed to show marked sustained improvement in this cohort of patients," said Dr. Sheth, who is also the director of Cain Foundation Labs for Pediatric Neurology at Duncan NRI and professor in the department of neurosurgery at Baylor College. "For this reason, we decided to simultaneously target two distinct regions of the brain—one implicated in OCD and the other in TS."

A multidisciplinary team of experts selected two patients as ideal candidates for testing this dual-target DBS surgery. Both patients presented with severe forms of both conditions and, despite extensive treatment histories, had not shown sustained clinical improvements. Dr.

Sheth implanted a pair of DBS electrodes in the bilateral ventral capsule/ventral striatum (VC/VS) region to treat OCD and another pair in the posteroventral (motor) globus pallidus internus brain area to treat TS using an established robotic procedure for DBS.

The new dual-target DBS strategy allowed Dr. Goodman and Dr. Bellows the flexibility to program the two DBS devices independently in order to achieve optimal and sustained improvement in severe OCD and TS symptoms in both patients.

Additionally, the DBS system they used not only stimulated these brain regions but also utilized recently available technology to record neural activity at different symptom states on the DBS device. These brain recordings allowed them to get a snapshot of the neural activity in that region at specific times (i.e. when OCD or TS symptoms were better or worse). The advantage of such a system is that it can be used to study the disease-modifying effects of DBS therapy on OCD- and TS-associated neurophysiology and thereby, optimize the delivery of this therapy in the future.

"The eventual goal is to move towards a 'closed-loop' DBS which will function analogous to how the thermostat in our homes regulates temperature," Dr. Sheth added. "When we set a particular temperature, the system automatically regulates the heating and cooling to ensure that the desired temperature is achieved and maintained. Similarly, as we understand the desired pattern of brain activity associated with healthy, asymptomatic states, we can train the DBS device to automatically adjust stimulation parameters in order to achieve and maintain that desired state. In order to move towards this goal, we need a better understanding of the intricate relationships between changes in neural signals and disease symptoms, which is what studies like this are helping build."

Others involved in the study were Ricardo Andres Najera, Nicole

Provenza, Huy Dang, Kalman Katlowitz, Alyssa Hertz, Sandesh Reddy, Ben Shofty, and Eric Storch. They are affiliated with one or more of the following institutions: Baylor College of Medicine and Texas Children's Hospital.

More information: Ricardo A. Najera et al, Dual-Target Deep Brain Stimulation for Obsessive-Compulsive Disorder and Tourette Syndrome, *Biological Psychiatry* (2023). DOI: 10.1016/j.biopsych.2023.01.014

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