

Deep brain stimulation to brain area linked to reward and motivation is potential therapy for depression

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Deep brain stimulation (DBS) to the superolateral branch of the medial forebrain bundle (MFB), which is linked to reward and motivation, revealed metabolic brain changes over 12 months post-DBS implantation, making it a strong potential therapy for treatment-resistant depression according to researchers at UTHealth Houston.

The results of the study, which included 10 patients, were published today in *Molecular Psychiatry*.

"This is something that people have been trying to do for a long time, but we have not always been very successful with using DBS for psychiatric illnesses," said first author Christopher Conner, MD, Ph.D., a former neurosurgery resident in the Vivian L. Smith Department of Neurosurgery at McGovern Medical School at UTHealth Houston. "But this PET study shows that we're altering how the brain is functioning long term and we are starting to change the way brain starts to organize itself and starts to process information and data." Conner is currently a fellow with the University of

Toronto.

For years, DBS has been used to treat patients suffering from [movement disorders](#) such as Parkinson's disease, tremor, and dystonia, and studied as a possible treatment for patients with [treatment-resistant depression](#). In DBS, electrodes are implanted into certain [brain areas](#), where they generate [electrical impulses](#) to affect [brain activity](#).

However, finding what part of the brain needs to be targeted to treat depression long term has been challenging.

"We targeted a bundle of fibers that leave this small area in the brainstem to travel to other areas throughout the brain," Conner said. "The PET scans indicated that this small target area has very diffuse downstream effects. It's not one single effect because there's not one single area of the brain linked to depression. The whole brain needs to be changed and through this one small target, that's what we were able to do."

Researchers performed an initial PET scan before the DBS procedure on the 10 patients in the study for a baseline image. They performed additional PET scans at six and 12 months to assess changes after treatment. Scans of 8 of the 10 patients showed a response.

"A responder to the treatment means that your depression potentially decreases at least 50%; you're feeling much better," said co-author João de Quevedo, MD, Ph.D., professor in the Louis A. Faillace, MD, Department of Psychiatry and Behavioral Sciences at McGovern Medical School.

"So, for patients with severe chronic treatment-resistant depression, decreasing our symptoms by half is a lot. It's the difference between being

disabled to being able to do something. Correlating with the PET image changes, our patients reported that their depression lessened after the treatment." De Quevedo also serves as director of the Translational Psychiatry Program and the Treatment-Resistant Depression Program, part of the Center of Excellence on Mood Disorders.

More information: Christopher R. Conner et al, Brain metabolic changes and clinical response to superolateral medial forebrain bundle deep brain stimulation for treatment-resistant depression, *Molecular Psychiatry* (2022). DOI: [10.1038/s41380-022-01726-0](https://doi.org/10.1038/s41380-022-01726-0)

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