Novel DBS Target Trajectory Strategy for Treating Refractory OCD with Major Depressive Symptoms: From the Bed Nucleus of Stria Terminalis to the Ansa Subthalamica

WSSFN 2025 Interim Meeting. Abstract 0104.

Eduardo Alho,[1] Pablo Fruett,[2] Paul Rodrigo Dos Reis,[1] Adriana Gutterres Pereira,[3] Paulo Roberto Franceschini.[4]

[1] University of São Paulo. Brazil.
[2] Federal University of Mato Grosso. Brazil.
[3] Inscer-Instituto do Cérebro do Rio Grande do Sul. Brazil.
[4] University of Caxias do Sul. Brazil.

Corresponding author: Eduardo Alho email:eduardoalho@hotmail.com

How to Cite: Alho E, Fruett P, Rodrigo Dos Reis P, Gutterres Pereira A, Franceschini PR. Novel DBS Target Trajectory Strategy for Treating Refractory OCD with Major Depressive Symptoms: From the Bed Nucleus of Stria Terminalis to the Ansa Subthalamica: WSSFN 2025 Interim Meeting. Abstract 0104. NeuroTarget. 2025;19(2):80.

Abstract

Introduction: In 2009, the FDA approved DBS for treatment-refractory OCD, even before robust evidence for safety and efficacy for this indication was stablished. Different targets were proposed to modulate the circuits involved in OCD, with variable results in the literature. In the same way, DBS targeting for depression is not a resolved theme in the literature. We aim to describe a novel approach for targeting dual pathology (OCD + Major Depression), including more than one responsive structure in the trajectory.

Clinical description: A 33-year old man with refractory and severe OCD associated major depression, was submitted to bilateral DBS, able to stimulate the bed nucleus of stria terminalis, anterior thalamic radiation, GPi, medial forebrain bundle and ansa subthalamica with a 8-contact electrode. Contact test was performed within 2-week interval, repeating depression and OCD scales for clinical evaluation. Pre and delayed post-operative MRIs were analyzed for cortical thickness.

Discussion: All scales for depression and for OCD had remarkable improvement. Best Y-BOCS and depression scores were obtained with the stimulation of the ansa subthalamica (remission of depressive and OCD symptoms). Besides the clinical improvement, there was increase in average cortical thickness for 125 cortical areas (Desikan-Kiliani Atlas), reduction in 20 cortical areas and no change in 3 after 6 months of DBS on in the AS. The average of increase for both hemispheres was 0.19 mm. The increased thickness was more pronounced bilaterally in the cingulate gyrus, pre-central gyrus, precuneus and superior frontal gyrus and left subcallosal gyrus, reaching 0.5 mm in some frontal regions. In 2019, we have characterized the ansa subthalamica (AS), a fiber tract linking the anteromedial pole of the subthalamic nucleus (STN) and the ventral globus pallidus internus (GPi), both limbic.[1] In 2020, we have described in patients submitted to lateral hypothalamic DBS for obesity in Prader-Willi syndrome that the activation of DBS settings in which the volume of activated tissue reached the AS (and not the MFB), were associated with manic symptoms in those patients.[2] With the above concepts in mind, it was possible to plan a trajectory of an 8-contact DBS lead that would reach structures from the BNST to the AS. The best clinical effect was obtained in the ventral contacts, where there is a confluence of limbic fibers (AS and STN-frontal fibers), which might be responsible for the optimized effect in the present case, modulating both frontal - as we have presented elsewhere [3] - but also basal ganglia (STN-GPiam) networks. The cortical changes in thickness observed likely reflect beneficial neuroplasticity in response to DBS-induced modulation of limbic, motor and cognitive circuits and are consistent with the clinical improvement, emotional regulation, and restoration of cognitive control. Some increases in areas such the precuneus might indicate re-engagement of self-awareness and self-image networks (part of the default mode network), commonly suppressed in major depression. Other areas affected in OCD and depression such as motor cortex and area 25 also increased their thickness after the therapy.

Conclusions: A novel strategy of targeting for OCD and Major Depression is hearby presented. The stimulation of the ansa subthalamica rendered good clinical outcomes, linked to plastic cortical changes and might be considered a potential target for investigation in OCD associated with major depressive.

References

1. Alho EJL, Alho ATDL, Horn A, Martin M da GM, Edlow BL, Fischl B, et al. The Ansa Subthalamica: A Neglected Fiber Tract. Mov Disord. 2020;35(1):75–80.
2. Gouveia FV, Gomes de Alvarenga P, Alho EJL, Takahashi RES, Franco R, Lopes AC, et al. The ansa subthalamica as a substrate for DBS-induced manic symptoms. Brain Stimul. 2020.
3. Hollunder B, Ostrem JL, Sahin IA, Rajamani N, Oxenford S, Butenko K, et al. Mapping dysfunctional circuits in the frontal cortex using deep brain stimulation. Nat Neurosci. 2024;27(3):573–86.