

Network-Specific Structural Connectivity of NAc/ALIC, MFB, and AMSTN in Treatment-Resistant OCD.

WSSFN 2025 Interim Meeting. Abstract 0028

Rene Marquez Franco,¹ Luis Ruelas,² Ricardo Loucao,¹ Rabea Schmal,¹ Fátima Ximena Cid Rodríguez,¹ Petra Heiden,¹ Veerle Visser-Vandewalle,¹ Pablo Andrade.¹

¹ Department Of Stereotactic And Functional Neurosurgery, University Hospital Cologne. Germany.

² Centro de Ciencias de la Complejidad, Instituto de Ciencias Nucleares, Universidad Nacional Autónoma.

Corresponding author: Rene Marquez Franco. Correo electrónico: rene.marquez@c3.unam.mx

How to Cite: Marquez Franco R, Ruelas L, Loucao R, Schmal R, Cid Rodríguez FX, Heiden P, et al. Network-Specific Structural Connectivity of NAc/ALIC, MFB, and AMSTN in Treatment-Resistant OCD: WSSFN 2025 Interim Meeting. Abstract 0028. NeuroTarget. 2025;19(2):13.

Abstract

Introduction: DBS has emerged as an effective therapy for treatment-resistant OCD (trOCD), yet clinical response remains heterogeneous. Increasing evidence suggests that therapeutic outcomes may depend on the specific functional networks modulated by each DBS target.¹ This study investigates how distant structural connectivity of 3 commonly used targets: nucleus accumbens/anterior limb of the internal capsule (NAc/ALIC), medial forebrain bundle (MFB), and anteromedial subthalamic nucleus (amSTN), correspond to distinct functional sub-networks, potentially mediating domain-specific symptom relief.²⁻⁵

Method: We analyzed 22 trOCD patients who underwent DBS at the University Hospital Cologne. We performed patient-specific probabilistic tractography and connectomic analysis. Structural connectivity matrices were generated with validated atlases. Key metrics included streamline counts, fractional anisotropy (FA), and mean diffusivity (MD) across functionally defined a priori regions. Statistical comparisons between targets were conducted using Kruskal–Wallis and post hoc pairwise tests.

Results: Distinct structural connectivity profiles were identified for each DBS target. NAc/ALIC showed strong connectivity with frontolimbic regions (medial OFC, insula, rACC; $p < 0.001$). MFB was linked to mesolimbic/reward-related areas (pallidum, rostral middle frontal cortex; $p < 0.001$). amSTN connected preferentially to motor-executive regions (precentral/paracentral gyri; $p < 0.001$). FA was significantly higher in amSTN and MFB pathways versus NAc/ALIC ($p < 0.05$).

Discussion: Distinct structural connectivity profiles were observed for each DBS target. NAc/ALIC was associated with affective and cognitive control networks, MFB with reward-related circuits, and amSTN with motor-inhibitory pathways. These differences may explain the target-specific clinical responses observed in OCD and underscore the im-

portance of network-informed DBS planning.

Conclusions: Our results support the use of patient-specific tractography to guide DBS target selection based on symptom domains. This strategy may improve treatment outcomes by aligning stimulation sites with the neural circuits underlying individual clinical symptoms.

References

1. Baldermann JC, Melzer C, Zapf A, Kohl S, Timmermann L, Tittgemeyer M, et al. Connectivity profile predictive of effective deep brain stimulation in obsessive-compulsive disorder. *Biol Psychiatry*. 2019;85(9):735–43.
2. Tyagi H, Apergis-Schoute AM, Akram H, Foltyniec T, Limousin P, Drummond LM, et al. A randomized trial directly comparing ventral capsule and anteromedial subthalamic nucleus stimulation in obsessive-compulsive disorder: Clinical and imaging evidence for dissociable effects. *FOCUS*. 2022;20(1):160–9.
3. Coenen VA, Polosan M, Schläpfer TE, Chabardes S, Meyer-Doll DM, Czornik M, et al. Deconstructing a common pathway concept for Deep Brain Stimulation in the case of Obsessive-Compulsive Disorder. *Mol Psychiatry*. 2025:1–12.
4. Li N, Baldermann JC, Kibleur A, Treu S, Akram H, Elias GJB, et al. A unified connectomic target for deep brain stimulation in obsessive-compulsive disorder. *Nat Commun*. 2020;11(1):336.
5. Horn A, Li N, Meyer GM, Gadot R, Provenza NR, Sheth SA. Deep Brain Stimulation response circuits in Obsessive Compulsive Disorder. *Biol Psychiatry*. 2025.