DBS OPENS A WINDOW INTO THE ORGANIZATIONAL GRADIENT OF FRONTAL NETWORK (DYS)FUNCTION.

SEPARATING THE PREFRONTAL CORTEX BY MEANS OF DBS

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To investigate the functional segregation of the prefrontal cortex via optimal connectivity profiles from DBS electrodes to the subthalamic nucleus (STN) treating 4 different disorders

INTRODUCTION

Fronto-subcortical neurocircuits are involved in the motor, cognitive, and affective dysfunctions of multiple brain disorders which can be treated by DBS

AIM

METHODS

Patients: 8 DBS patient cohorts from 7 centers – dystonia (DYT; N = 76), Parkinson’s disease (PD; N = 95), Tourette syndrome (TS; N = 14), and obsessive-compulsive disorder (OCD; N = 19)

Clinical improvement: Burke-Fahn-Marsden Dystonia Rating Scale (DYT), Unified Parkinson’s Disease Rating Scale Part III (PD), Yale Global Tic Severity Scale (TS), and Yale-Brown Obsessive-Compulsive Scale (OCD)

Methodological workflow:
(1) Reconstruction of precise DBS electrode placement and stimulation volumes (E-fields) using Lead-DBS software
(2) DBS Sweet-Spot Mapping (A), DBS Fiber Filtering (B) and DBS Network Mapping (C) to identify voxels and normative tracts/cortical projection sites related to optimal clinical stimulation outcome per disorder

RESULTS

By its impact on distributed networks, DBS is a meaningful tool to functionally segregate the prefrontal cortex.

A functionally selective, caudo-rostral gradient of cortical organization is mirrored within the subcortex – in spatially compressed form.

This “information funnel effect” may explain why DBS to integrator hubs (e.g., the STN) is an effective treatment for a variety of brain disorders of heterogeneous phenomenology.

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