electrodes localizing the clinical symptom categories. It facilitates overview of the observed symptoms during stimulating electrodes.
Conclusion
We created a time-saving and user-friendly clinical tool that standardized the workflow of electrical stimulation in intracranial EEG. Although categorization of annotations reduced information compared to free text, the format improves uniformity and creates overview. This tool facilitates decision making for determining the resection area during presurgical evaluation.
Research Category and Technology and Methods
Clinical Research: 23. Neurophysiology
Keywords
intracranial electrical stimulation, clinical symptoms categorization, electrode visualization, graphical user interface

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P2.081

LONG-TERM SUBTHALAMIC NUCLEUS RECORDINGS VIA DBS SENSING IN PARKINSON'S DISEASE PATIENTS REVEAL PERIODOGRAMS LINKED TO CIRCADIAN RHYTHMS AND MEDICATION INTAKE

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Abstract
Background: Deep brain stimulation (DBS) is a widely accepted surgical treatment for Parkinson's disease (PD), offering substantial and long-lasting motor improvements. While DBS parameters are typically adjusted based on clinical evaluations, the neuromodulatory effects of DBS during daily activities remain poorly understood. This study aims to investigate electrophysiological patterns related to circadian rhythms and daily medication intake to better understand these effects.
Methods: We collected longitudinal home-recorded data over 25-97 days from four patients (age: 56.2±11.8 years; disease-duration: 10.5±4.8 years) with bilateral Medtronic Percept™ DBS devices. Clinical assessments were based on the MDS-UPDRS. Local Field Potentials (LFPs) in the beta band were monitored for long-term sensing. LFP data were saved every 10 minutes, and patients used a smartphone app to mark medication intake. Circadian patterns were explored by comparing brain activity during day and night, while diurnal activity was examined using Welch's power spectral density to create periodograms. The impact of medication intake on LFPs was analyzed by comparing LFP changes at intervals before and after medication intake.
Results: Our findings revealed significant differences in beta band LFP means between day and night across all patients ($p<0.0001$). Sleep-related symptoms in one patient were observed to influence this cycle. Additionally, a distinct pattern of LFP reduction following medication intake was identified in three patients, with a statistically significant decrease ($p<0.0001$).
Conclusions: Future research into LFP signals and event-related spectral data holds great potential for providing clinicians with deeper insights into patients' conditions. This includes more accurate evaluations of sleep quality, medication effects, and treatment outcomes, particularly through home-based monitoring. Combining in-clinic assessments with real-time, long-term data will enhance our understanding of patient symptoms and well-being, paving the way for adaptive and personalized treatments, such as adaptive DBS (a-DBS), that are tailored to each patient's unique neural activity.
Research Category and Technology and Methods
Clinical Research: 1. Deep Brain Stimulation (DBS)
Keywords
DBS, Parkinson's disease, Local field potentials, circadian rhythm

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LATERALIZATION OF PUPIL DILATION AS A NOVEL BIOMARKER FOR DOSE-DEPENDENT EFFECTS OF VAGUS NERVE STIMULATION

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Abstract
Vagus nerve stimulation (VNS) is an adjunctive therapy for drug-resistant epilepsy, but its mechanism of action remains incompletely understood, necessitating optimization. VNS-induced pupil dilation, reflecting Locus Coeruleus (LC)–noradrenaline system activity, has emerged as a promising biomarker. Acute VNS elicits a phasic increase in LC firing, leading to dose-dependent pupil dilation in animal models and patients. Unilateral VNS can induce bilateral pupil dilation, with asymmetrical responses observed in humans during transcutaneous VNS (tVNS), possibly due to stronger LC activation by left-sided VNS. Therefore, the lateralization ratio of pupil dilation (left vs. right eye) could serve as a novel biomarker for VNS efficacy.
In this preliminary study, we recorded pupil size in four VNS-implanted patients under various stimulation conditions: high (routine + 0.25 mA), mid (routine), and low (routine − 0.5 mA) intensities, and high (30 Hz), mid (25 Hz), and low (20 Hz) frequencies. Stimulation trains of 11 seconds were delivered in blocks of three, with 18-second off periods. Mean pupil dilation response was computed during stimulation intervals to compare responses across conditions.
We observed bilateral pupil dilation in all patients. Notably, a preliminary lateralization ratio indicated asymmetrical pupil dilation that varied dose-dependently with both stimulation intensity and frequency.
These preliminary findings suggest that the lateralization ratio of pupil dilation reflects the dose-dependent effects of unilateral VNS on the LC–noradrenaline system. Further research with a larger cohort is needed to confirm this observation and to assess its correlation with clinical outcomes, potentially establishing it as an innovative biomarker for optimizing VNS therapy.
Research Category and Technology and Methods
Clinical Research: 12. Vagus Nerve Stimulation (VNS)
Keywords
Vagus Nerve Stimulation, Pupil size , locus coeruleus - noradrenalin

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INTRACRANIAL INTERMITTENT THETA BURST STIMULATION AND HEART BRAIN COUPLING

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Abstract
Background: Transcranial magnetic stimulation-induced entrainment of heart rate, called heart brain coupling (HBC), is believed to involve a frontal-vagal pathway that includes the dorsolateral prefrontal cortex (DLPFC), subgenual anterior cingulate cortex (sgACC) and dorsal anterior cingulate cortex (dACC). However, alternative peripheral routes for these heart rate changes such as pain or trigeminal activation have been proposed.
Objective: Here, we describe the case of a 24-year old male with treatment-resistant OCD who underwent invasive stereo EEG (sEEG) implantation as part of a clinical trial. We applied electrical stimulation in an intermittent theta burst (iTBS) pattern to 6 brain sites, a subset of which belonged to the frontal-vagal pathway, to attempt to induce HBC.
Methods: iTBS was applied via sEEG to 2 fronto-vagal sites, the sgACC and the dACC, along with 4 non frontal-vagal sites (3 prefrontal and one