

Globus pallidus interna oscillatory activity differentiates tics from voluntary movements and the Parkinsonian resting state

J. Jimenez-Shahed, I. Telkes, A. Viswanathan, N.F. Ince (Houston, TX, USA)

Meeting: [2016 International Congress](#)

ABSTRACT NUMBER: 1188

Keywords: [Deep brain stimulation \(DBS\)](#), [Neurophysiology](#), [Tics\(also see Gilles de la Tourette syndrome\)](#): [Pathophysiology](#)

Session Information

Date: [Wednesday, June 22, 2016](#)

Session Time: 12:00pm-1:30pm

Session Title: [Neurophysiology \(non-PD\)](#)

Location: Exhibit Hall located in Hall B, Level 2

Objective: To describe local field potential (LFP) characteristics during tic activity, voluntary activity, and the Parkinsonian resting state.

Background: Deep brain stimulation is an emerging treatment for severe, medication-refractory Tourette syndrome (TS). While the neurophysiological correlates of Parkinson's disease (PD) in the globus pallidus interna (GPI) and subthalamic nucleus (STN) are increasingly recognized, these patterns are not well characterized in other disease states such as dystonia and TS. Recently, cross frequency coupling (CFC) between beta band and high frequency oscillations (HFOs) within the STN in PD patients was found to be pathologic, as it vanishes following medication administration and correlates with motor improvement.

Methods: Intraoperative LFPs from the postero-ventrolateral GPI in two adult TS patients at rest, during tic activity, and during voluntary movements mimicking tic activity were compared to the intraoperative GPI-LFPs recorded from four unmedicated PD patients at rest.

Results: In the PD patients, we noted excessive beta band activity (11-30Hz) which consistently modulated the amplitude of the co-existent HFOs (200-400Hz), indicating beta-HFO CFC. In both TS patients at rest, we observed HFOs in the 200-400Hz range but no excessive beta band activity, and no beta-HFO CFC. However, in one TS patient (but not the other), CFC between 7Hz and 350Hz oscillations was found. In both TS patients, consistently, tic activity was associated with excessive high frequency and gamma band (200-400Hz and 35-200Hz, respectively) activity. During voluntary movements mimicking tics, the energy in these bands increased as well, but not to the same degree as during tic activity.

Conclusions: These findings augment our understanding of the pathophysiology of tics in TS and extend our knowledge about beta-HFO CFC in PD. This is the first study demonstrating beta-HFO CFC in the GPI of PD patients, as previously demonstrated in the STN, suggesting that beta-HFO CFC is specific to PD. The absence of beta-HFO CFC in the GPI of TS patients suggests that different pathologic circuits are involved in TS. Furthermore, our findings suggest that the modulation of gamma and HFO rhythms characterize both voluntary movements as well as tics, but can also differentiate them. Our findings can inform the development of a closed loop stimulation system when tics are present.

To cite this abstract in AMA style:

J. Jimenez-Shahed, I. Telkes, A. Viswanathan, N.F. Ince. Globus pallidus interna oscillatory activity differentiates tics from voluntary movements and the Parkinsonian resting state [abstract]. *Mov Disord.* 2016; 31 (suppl 2). <https://www.mdsabstracts.org/abstract/globus-pallidus-interna-oscillatory-activity-differentiates-tics-from-voluntary-movements-and-the-parkinsonian-resting-state/>. Accessed April 28, 2023.

MDS Abstracts - <https://www.mdsabstracts.org/abstract/globus-pallidus-interna-oscillatory-activity-differentiates-tics-from-voluntary-movements-and-the-parkinsonian-resting-state/>