[0449]

EFFECTS OF ON AND OFF SUBTHALAMIC NUCLEUS-DBS ON PREFRONTAL CORTEX ACTIVATION DURING A COGNITIVE TASK: AN FNIRS STUDY

M. Muthalib*[1,2], M. Muthuraman[3,4], G.K. Kerr[5], L.K. Byrne[1], R.G. Bittar[6,1], G. Deuschl[3], S. Perrey[1]. [1] *Deakin University, Australia;* [2] *University of Montpellier, France;* [3] *Christian-Albrechts University, Germany;* [4] *Johannes-Gutenberg-University Hospital, Germany;* [5] *Queensland University of Technology, Germany;* [6] *Precision Brain, Spine and Pain Centre, Australia*

Subthalamic nucleus (STN) deep brain stimulation (DBS) therapy is an effective treatment for the appendicular motor symptoms of Parkinson's disease (PD). The STN contains multiple segregated circuits subserving motor, cognitive and mood functions through distinct connectivity to cortical regions. Therefore, we examined prefrontal cortical (PFC) effects of "ON" and "OFF" STN-DBS on executive function (Go/NoGo) using functional near-infrared spectroscopy (fNIRS).

Methods: Out of 8 PD STN-DBS patients, we present here preliminary analysis of a male (62y) PD patient with bilateral STN-DBS (unipolar, 180Hz, 3.5V). The patient was tested after 12h withdrawal of dopamine medications in both an "OFF" and "ON" DBS session separated by 30min. The subject performed a computerised GoNoGo task with 3 alternating Go/NoGo blocks of 30s duration (20 trials/block) interspersed with 30s rest. Reaction time (RT) and accuracy (omission-Om and commission-Cm errors) results were the average of the 3 Go/NoGo blocks. During performance of the Go/NoGo blocks, changes in oxygenated (O_2Hb) and deoxygenated (HHb) haemoglobin concentrations were measured by a fNIRS system (Oxymon MkIII, Artinis Medical Systems) covering the bilateral PFC regions.

Results/Discussion: Clinical motor performance (UPDRSIII) improved from OFF (31) to ON (20). RT during Go and NoGo was ~40ms faster in OFF (460 and 364ms) than ON (516 and 407ms). Furthermore, the NoGo condition increased misses (Om) in ON (7%) than OFF (0%); while false alarms (Cm) were similarly increased in ON (27%) and OFF (30%). The Go and NoGo conditions increased bilateral PFC activation (i.e., increase in O_2Hb and decrease in HHb). However, there was a general decrease in PFC activation in OFF relative to ON, and this was more obvious in Go than NoGo (see Fig. 1)

Conclusion: These preliminary results indicate that STN-DBS modulates neurovascular responses in the bilateral PFC that are associated with response inhibition.

Keywords: Executive function, Prefrontal cortex, Functional near-infrared spectroscopy, Go/NoGo

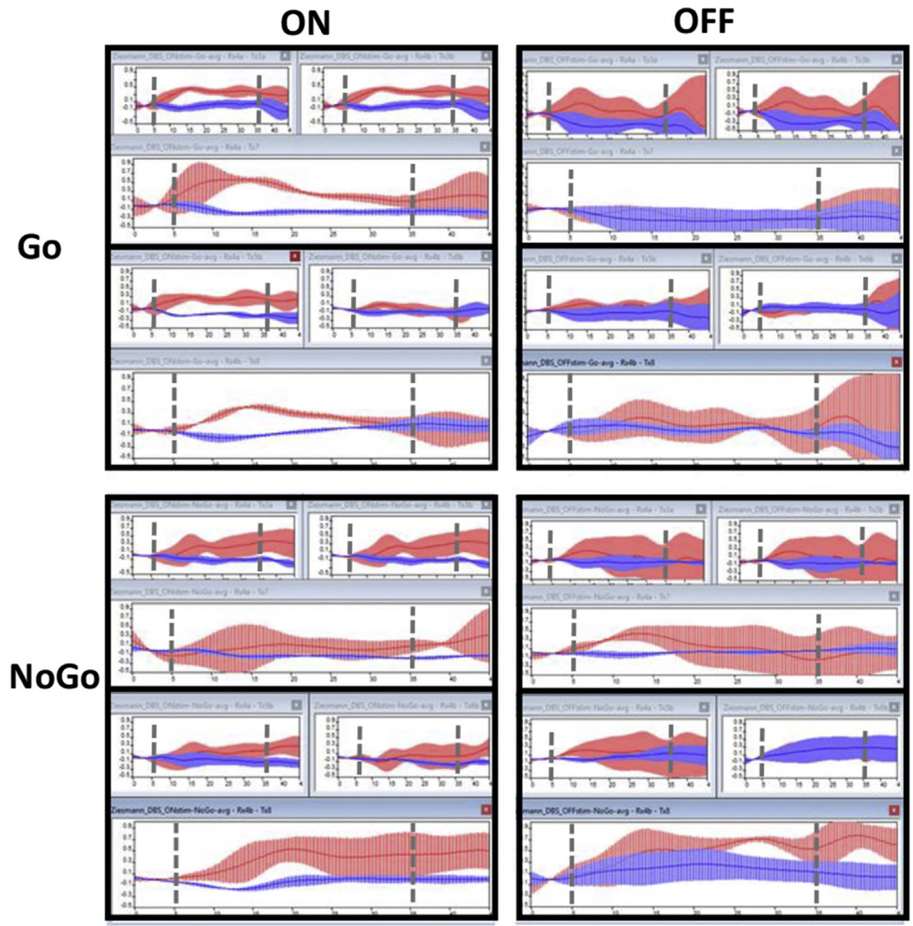

Fig.1 Left (upper 3 panels) and right (lower 3 panels) PFC O_2Hb (red trace) and HHb (blue trace) time course during the Go and NoGo conditions with STN-DBS ON and OFF. The O_2Hb and HHb time course over the 30s Go/NoGo task period (grey dashed line) was the average of 3 blocks.