Automated Parkinson's disease gait and balance assessment for optimization of deep brain stimulation

Thomas O. Mera, MS1, Daniel E. Filipkowski, BS1, David E. Riley, MD2, Benjamin L. Walter, MD2, Steven A. Gunzler, MD2, Joseph P. Giuffrida, PhD1
1Great Lakes NeuroTechnologies Inc., Cleveland, OH, 2Center of Movement Disorders, University Hospitals Case Medical Center, Cleveland, OH

Methods

KinetiSense consists of five motion sensor units each containing accelerometers and gyroscopes, and a command module for synchronized wireless data transfer.

Conclusion

Gait and balance disturbances, especially in advanced Parkinson’s disease (PD) patients, can be very debilitating and may lead to increased fall risk. Deep brain stimulation (DBS) surgery is a treatment option when medication-induced side effects including motor fluctuations and dyskinesias impact patient quality of life. Significant challenges are associated with DBS programming for gait and balance including variable and delayed response across motor symptoms. Therefore, developing improved neuromodulation assessment tools for optimizing gait and balance response to DBS is still needed.

Goal: The objective of this study was to use motion sensors to capture kinematic data while PD subjects performed gait and balance tasks based on the Unified Parkinson’s Disease Rating Scale (UPDRS), extract data features highly correlated to clinician UPDRS scores, and capture changes in symptom severity in response to DBS.

Motion data was successfully captured from PD subjects performing gait and balance tasks based on the UPDRS.

Kinematic features extracted from motion data were highly correlated to UPDRS clinician scores.

Small but significant changes in gait and balance symptom severity were captured in response to DBS.

This motion analysis technology can provide high sensitivity measures to better understand the effect of established and under investigation DBS targets on gait and balance impairment.

This work was supported by NIA, SR43AG033947

For additional information, please contact Tom Mera at tmera@glneurotech.com