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O-FUN-16 - A Real-Time Intra-Operatory System for Rigidity Evaluation during Deep Brain Stimulation Surgery

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Resumen

Objectives: Deep Brain Stimulation (DBS) has a proved value in the treatment of severe forms of Parkinson's Disease. Intraoperative evaluation of the efficacy of stimulation includes evaluation of the effect on rigidity. A subjective semi-quantitative scale is used, dependent on the examiner perception and experience. So, the system proposed herein aims to tackle this subjectivity, using quantitative data and providing real-time feedback of the computed rigidity reduction, hence supporting the physician decision.

Material and methods: This system comprises of a gyroscope-based motion sensor in a textile band, placed in the patient's hand, which communicates its measurements to a smartphone. The latter computes a signal descriptor from the angular velocity of the hand during wrist flexion in DBS surgery and applies a polynomial model to determine the rigidity reduction, which is communicated to the physician. This model was trained using signals from 8 patients (Mean Age: 61) and validated in 5 patients (Mean Age: 56) surgeries. These patients were subjected to bilateral DBS implantation and stimulation.

Results: The system presented 3.2% of error and 77.1% of accuracy (when compared to two specialists' agreement). The implemented descriptor proved to discriminate well high and low rigidity reduction (p 0.001), but was unable to distinguish equal improvements from patients with different baseline rigidity. This will hinder the future design of different models for each baseline rigidity profile.

Conclusions: Overall, we present a simple, wearable, mobile system, suitable for intra-operatory conditions during DBS, providing a reliable second-opinion about the improvement in rigidity for different stimulation settings.