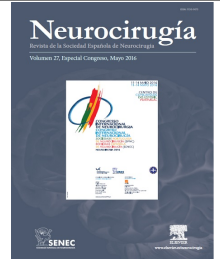




# Neurocirugía



<https://www.revistaneurocirugia.com>

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

A.S. Assis<sup>1</sup>, R. Vaz<sup>2,3</sup>, M.J. Rosas<sup>4</sup>, C. Chamadoira<sup>2</sup>, P. Costa<sup>1</sup> and J.P. Silva Cunha<sup>1</sup>

<sup>1</sup>INESC TEC e Faculdade de Engenharia, Universidade do Porto, Porto. <sup>2</sup>Serviço de Neurocirurgia; <sup>4</sup>Serviço de Neurologia, Centro Hospitalar de São João, Porto. <sup>3</sup>Unidade de Neurociências, Hospital CUF, Porto.

### 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.