

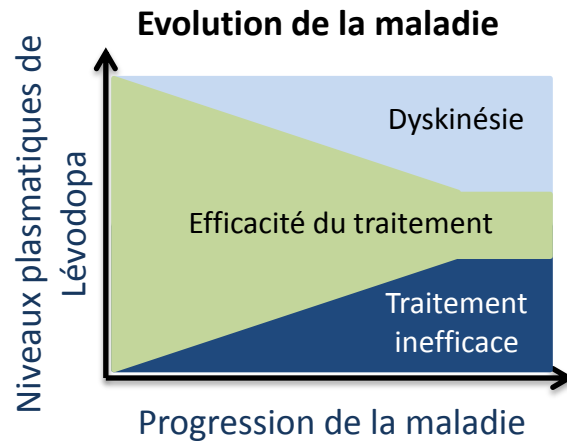
A NOVEL ASSISTIVE METHOD FOR RIGIDITY EVALUATION DURING DEEP BRAIN STIMULATION SURGERY USING ACCELERATION SENSORS

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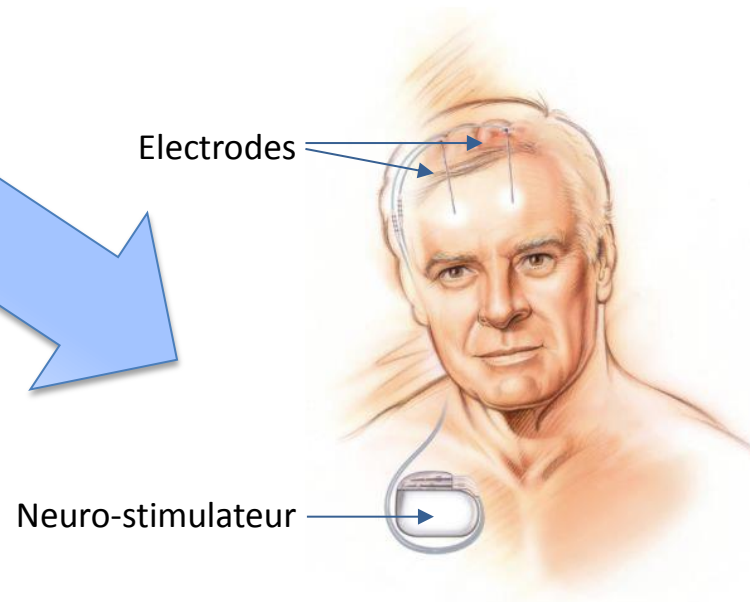
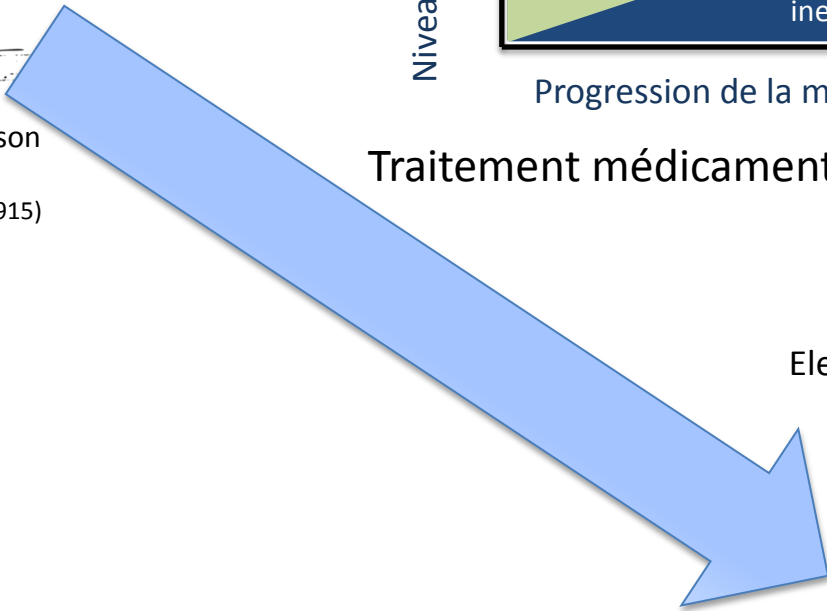
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Illustration de la maladie de Parkinson par William Richard Gowers (neurologue, chercheur et artiste; 1845-1915)

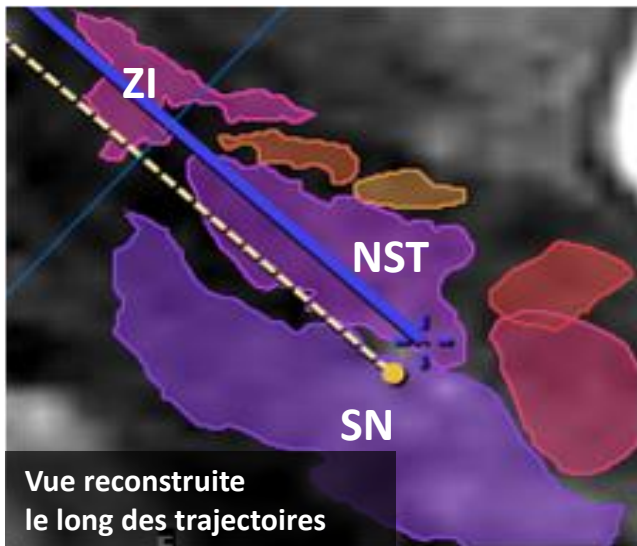


Traitement médicamenteux (1967)



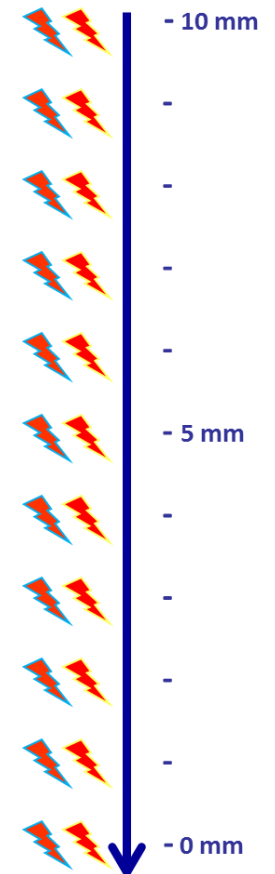
Stimulation cérébrale profonde (1987)

- Stimulation 130 Hz et 60 μ sec (tous les 1mm sur maximum 10 mm)
- ➤ intensité de 200 μ A à 3 mA maximum
 - Recherche d'un seuil d'amélioration clinique
 - Recherche d'un seuil d'apparition d'effets secondaires
- Stimulation = **test clé** pour le placement des électrodes définitives



Trajectoires

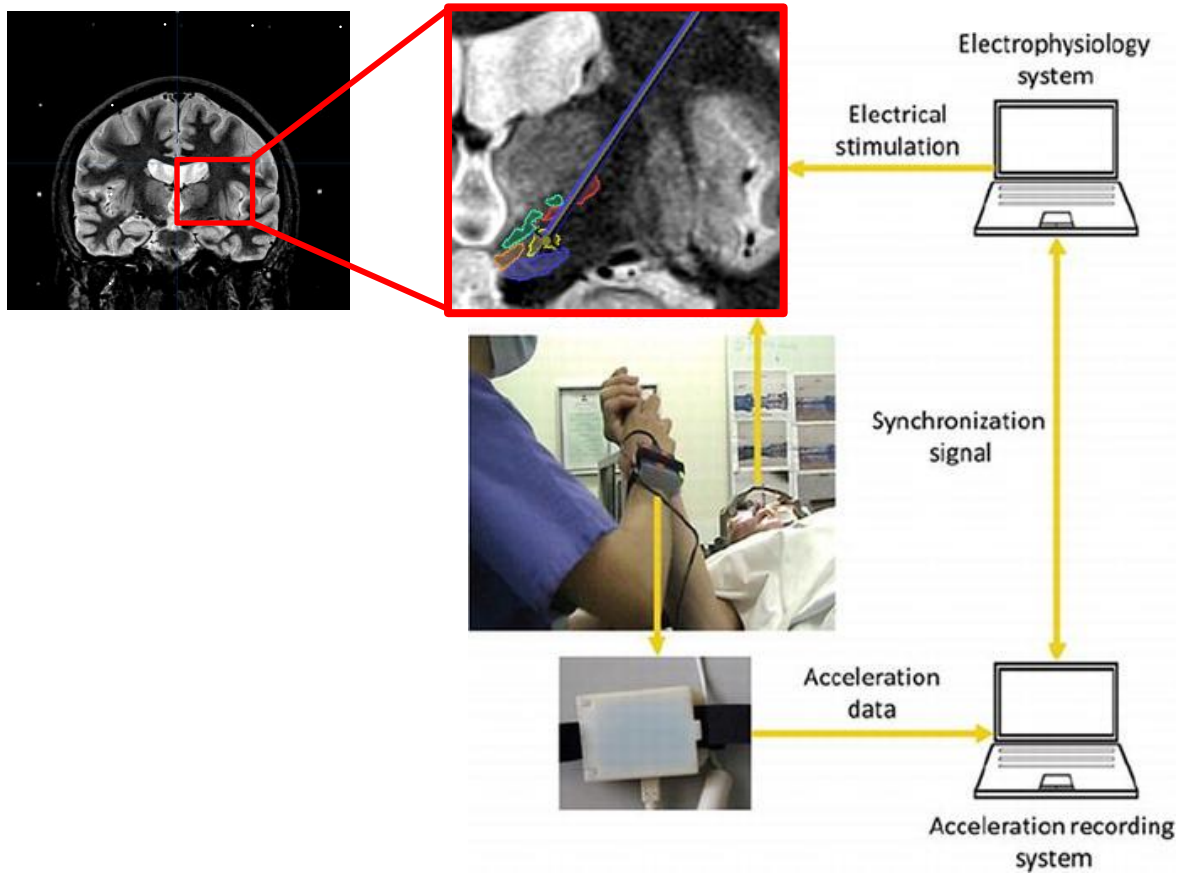
Cen 2mm dist

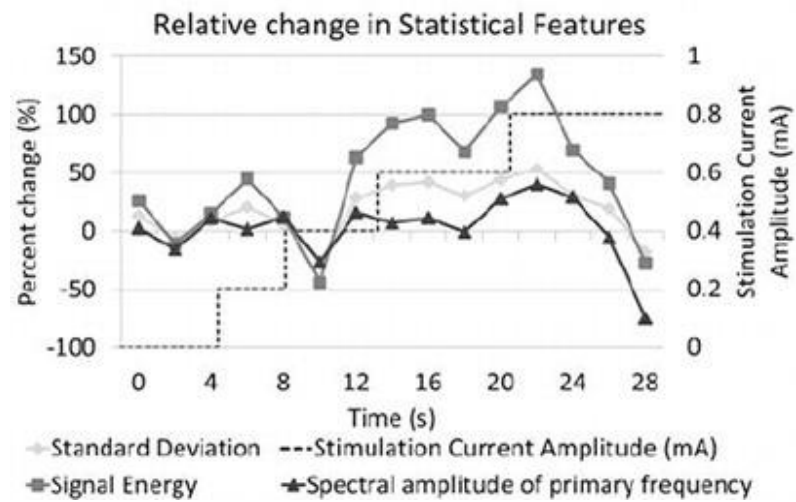
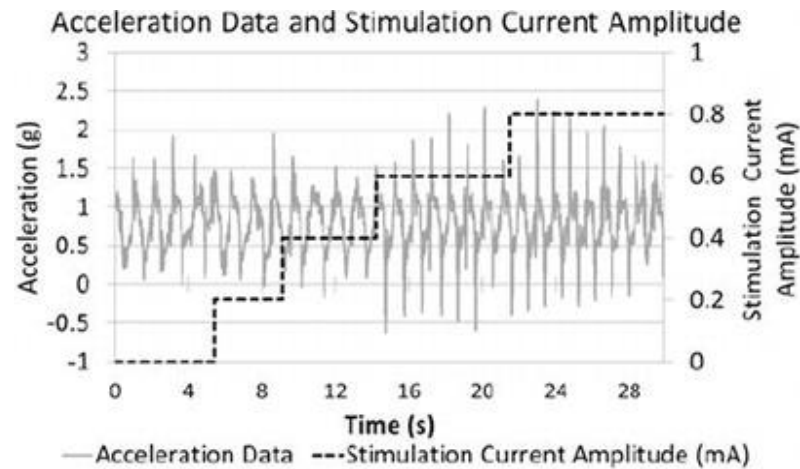


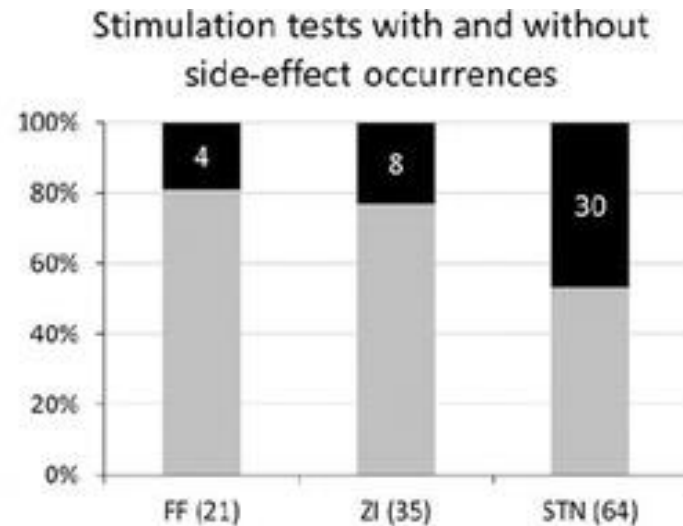
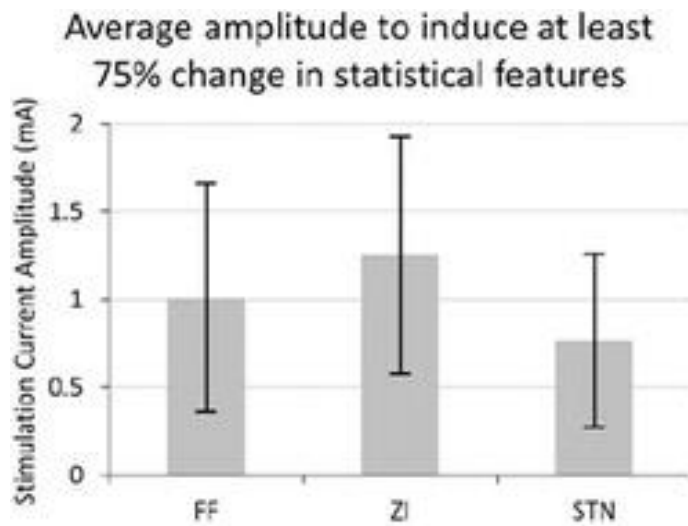
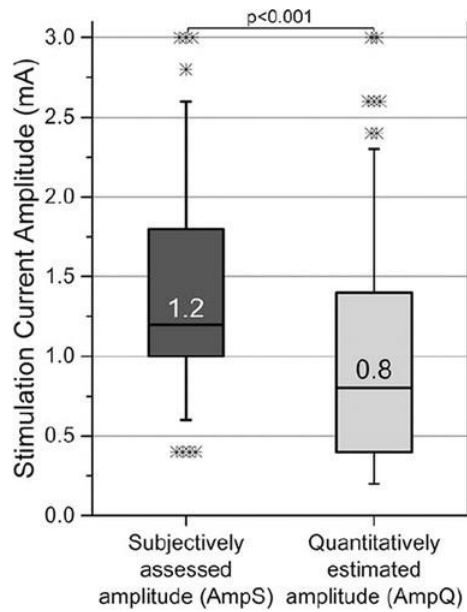


Patient No.	Age at Surgery (yrs)	Preop UPDRS-III Scores (medication off)	Evaluator ID	Tested Trajectories (no. of stimulation positions)	
				Lt	Rt
1	67	17	E1	Central (9), posterolateral (9)	Central (8), posterolateral (8)
2	60	26	E1	Central (8), posterior (8)	Central (3), posterior (3)
3	53	39.5	E1	Central (4), posterior (4)	Central (8), posterior (8)
4	61	26	E4	Central (8), posterior (8)	Central (6), posterior (6)
5	66	35	E3	Central (8), posterior (8)	Central (7), posterior (7)
6	69	45	E2	Central (6), posterior (6)	Central (6), posterior (6)
7	57	45	E4	Central (8), posterior (8)	Central (8), posterior (8)
8	69	27	E2	Central (7), posterior (7)	Central (7), posterior (7)
9	53	43	E2	Central (7), posterolateral (7)	Central (7), posterolateral (7)

UPDRS-III (/108): 12-30 maladie installée, 30-80 maladie sévère







Feasibility of Intraoperative Use

Identification of Rigidity Release Threshold

Impact on Surgical Decision Making

Anatomical Analysis

Future Work

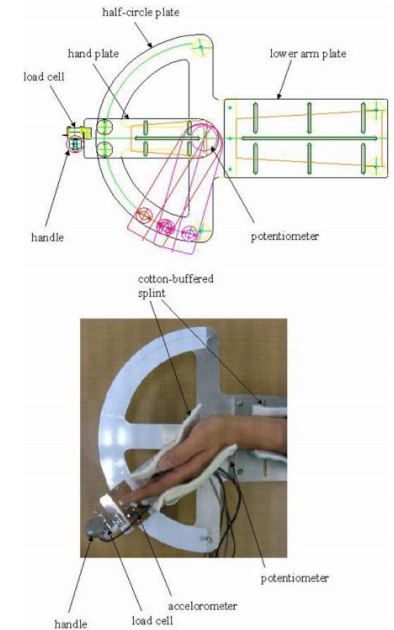


Fig. 1. Experimental setup.

Park BK *et al.* IEEE Trans Neural Syst Rehab Eng, 2011

Présente étude: évaluation de la rigidité

Shah A., Coste J., Lemaire JJ., Schkommodau E., Taub E., Guzman R., Derost P., Hemm-Ode S. (2017) A novel assistive method for rigidity evaluation during deep brain stimulation surgery using acceleration sensors. *Journal of Neurosurgery* **127(3)**, 602-612 ^[4,059]

Etude connexe: évaluation du tremblement

Shah A., Coste J., Lemaire JJ., Taub E., Schüpbach M., Pollo C., Schkommodau E., Guzman R., Hemm-Ode S. (2017) Intraoperative acceleration measurements to quantify improvement in tremor during deep brain stimulation surgery. *Medical & Biological Engineering & Computing* **55(5)**, 845-858 ^[1,916]

Etude en imagerie: simulation du champ électrique

Hemm S., Pison D., Alonso F., Shah A., Coste J., Lemaire JJ., Wårdell K. (2016) Patient-specific electric field simulations and acceleration measurements for objective analysis of intraoperative stimulation tests in the thalamus. *Frontiers in Human Neuroscience* **10**, 577 ^[3,209]