



HAL
open science

Chronic DBS stimulation of minimally conscious state: methodological issues

Jean-Jacques Lemaire, Bénédicte Pontier, Anna Sontheimer, Fabien Feschet,
Jérôme Coste, Hachemi Nezzar, Emmanuel de Schlichting, Jacques Luaute,
Thierry Sarraf, Catherine Sarret, et al.

► **To cite this version:**

Jean-Jacques Lemaire, Bénédicte Pontier, Anna Sontheimer, Fabien Feschet, Jérôme Coste, et al..
Chronic DBS stimulation of minimally conscious state: methodological issues. 22nd Congress ESSFN
Madrid, Sep 2016, Madrid, Spain. pp.1 - 132, 10.1159/000448961 . hal-01654763

HAL Id: hal-01654763

<https://uca.hal.science/hal-01654763>

Submitted on 7 Nov 2018

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Chronic DBS Stimulation of Minimally Conscious State: Methodological Issues

Jean-Jacques Lemaire^{1,2}, Benedicte Pontier^{1,2}, Anna Sontheimer^{1,2}, Fabien Feschet¹,
Jérôme Coste^{1,2}, Hachemi Nezzar³, Emamnel De Schilchting^{1,2}, Jacques Luaute⁴,
Thierry Sarraf⁵, Catherine Sarret¹, Guillaume Coll^{1,2}, Sarah Dominique Rosenberg¹,
Jean Gabrillargues⁶

1. Image-Guided Clinical Neurosciences and Connectomics (EA 7282, IGCNC), Université d'Auvergne, Clermont-Ferrand, France;
2. Service de Neurochirurgie, CHU de Clermont-Ferrand, Clermont-Ferrand, France;
3. Service d'Ophtalmologie, CHU de Clermont-Ferrand, Clermont-Ferrand, France;
4. Service de MPR, Hospices Civiles de Lyon, Lyon, France;
5. Service de rééducation, Aveize, France;
6. Service de Neuro-radiologie, CHU de Clermont-Ferrand, Clermont-Ferrand, France.

Keywords: DBS, Consciousness, Brain injury.

DOI: 10.1159/000448961

Introduction: The modulation of consciousness processes with deep brain stimulation (DBS) in minimally consciousness state seems achievable. Between 1968 and 2016 nine teams have reported effects in 58 vegetative (VS) or minimally conscious (MCS) patients. We analyzed the literature focusing on methodological issues, willing to address clinically relevant key-points for the selection of targets and design of future studies.

Literature Review: Half of the studies were case-reports. Most teams intended to place electrodes in the thalamus. All leads were implanted according to atlas-based coordinates. Five studies used low frequency stimulation, 25 to 50 pulses/sec, and three high frequency stimulation, at 100 and 250 pulses/sec. The most recent studies reported effects in continuing VS-MCS patients, followed up during several months or years. The clinical status and DBS effects were measured using simple clinical observations, up to JFK Coma Recovery Scale–Revised. Parallel to the clinical status, the most recent study analyzed the extent of brain lesions. No severe irreversible, stimulo-induced, adverse effects were reported, but one patient had post-operative intra cerebral hematoma. One clinical study had double-blinded on/off crossover phase, whereas the others were observational studies. From these studies it can be inferred that high or low frequency stimulation of deep gray structures, particularly of the central thalamus, can provoke overt conscious behaviors. Recent literature concerning models of consciousness related circuitry let us think that several deep brain regions and cortices are involved and could be future relevant spots of neuromodulation.

Conclusion-Perspective: Future studies willing to modulate the deep brain circuitry should take into account the recent knowledge on altered dynamics of neural correlates of disorder of consciousness, the dynamics of spontaneous recovery, and the consequences of structural and functional lesions.