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Gezamenlijk Doctoraat VUB & KU Leuven  
Joint PhD VUB & KU Leuven  
2013-2014

Public defence of

**Maarten MOENS**

To obtain the Joint academic degree of

'**DOCTOR IN MEDICAL SCIENCES**' (VUB)

'**DOCTOR OF BIOMEDICAL SCIENCES**' (KU Leuven)

**Functional neuroimaging in patients with failed back surgery syndrome treated with spinal cord stimulation: *the investigation of supraspinal effects of spinal cord stimulation***

Promotors: Prof. Jan Poelaert & Prof. Bart Nuttin

Co-promotors: Prof. Steven Droogmans & Prof. Stefan Sunaert

**Tuesday 19 November 2013**

Auditorium **P. Brouwer**, 17:00

Faculty of Medicine and Pharmacy, Laarbeeklaan 103, 1090 Brussel

How to reach the campus Jette:

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**KU LEUVEN**

## Summary of the dissertation

Chronic neuropathic pain constitutes the hallmark feature of failed back surgery syndrome (FBSS). This pathology exerts a major detrimental impact on the patients, their families and the society. Spinal cord stimulation (SCS) is an effective, minimally invasive treatment option for patients with FBSS. However, the success rate of SCS and its underlying pathophysiological mechanisms remain unclear.

This thesis describes the rationale and the first steps in the scientific process to identify the largely unknown supraspinal effects of SCS. Before the in vivo testing of patients with FBSS we conducted an in vitro study to determine the safety of brain functional MRI and proton MR Spectroscopy on the trial SCS by means of measuring the temperature changes at the tip of the electrode, the geometrical movements of the electrode and the stability of the software and hardware of the SCS.

Applying current state of the art experimental tools (functional MRI and proton MRS) in patients with FBSS, we were able to demonstrate that the thalamus plays a functional and a neurobiological role in the supraspinal mechanisms of action of SCS. Deactivation of the thalamus and increase of  $\gamma$ -aminobutyric acid in the ipsilateral thalamus during SCS resulted in a new hypothesis with regard to the involvement of the spino-reticulo-thalamo-cortical pathway in SCS. The findings in this thesis were obtained thanks to a close collaboration of many departments of the UZ Brussel and UZ Leuven.

## Curriculum Vitae

Maarten Moens was born on the 7<sup>th</sup> of August 1977 in Dinant, Belgium. He is married to Ann De Smedt and father of two fantastic boys, Oscar and Cyril. He followed his secondary education at the Heilig Hart College, Heusden-Zolder and graduated in 1995. That same year he started medical school at the Limburgs Universitair Centrum (now Universiteit Hasselt) for the next three years. He fulfilled his medical education at the Vrije Universiteit Brussel where he obtained his medical degree in 2002, magna cum laude. His neurosurgical residency started in 2002 in the Academisch Ziekenhuis VUB (now Universtiair Ziekenhuis Brussel) in the Department of Professor Dr. Jean D'Haens. Maarten Moens promoted in 2008 and started his career as a neurosurgeon in the UZ Brussel. From October 2008 to September 2010, he received a clinical mandate by the Research Foundation Flanders (FWO) to prepare this thesis. During this period of clinical research, he obtained also the additional degree of intensive care specialist. Nowadays, he works as a neurosurgeon specialised in neuromodulation in the Department of Neurosurgery and as a neurosurgeon in the Department of Radiology (interventional neuroangiography) at the UZ Brussel