



Effect of Central Nervous System Neuromodulation on Breathing and Breathlessness

Menaka Paranathala BMBCh MA MRCS; Ian Pavord; Kyle Pattinson; John Stradling; Alexander L. Green MBBS, BSc

University of Oxford, United Kingdom



UNIVERSITY OF
OXFORD

Introduction

Reports of a link between deep brain stimulation (DBS) and autonomic function exist in the literature¹. Questionnaires have shown a subgroup of patients with subthalamic (STN) stimulation had increased dyspnoea³ post operatively, compared to control DBS patients⁴. It has been shown that subthalamic(STN) stimulation for Parkinson's disease changes ventilatory function, namely improving PEFr, but not volumetric measures of lung function². This was not explained by improvement in skeletal muscle function alone. The question arises as to whether the dyspnoea reported is a subjective or objective phenomenon.

Methods

We conducted measurements of electrocardiography, spirometry, oscillometry and capnography of patients with DBS of various nuclei, at different stimulator settings, to further investigate this. Stimulation was either at normal frequency (approximately 150Hz), low (30Hz) or off. Of the patients recruited, there were a range of nuclei being stimulated, including the STN and Gpi for movement disorder and anterior cingulate for chronic pain. Questionnaires were also conducted, including the St George's Respiratory Questionnaire, Dyspnoea-12 and SF36. Ethics was obtained for this study.

Results

There was an interesting constellation of findings, with the STN being associated with subjective dyspnoea in a subset of patients. There are differences in the spirometric and oscillometric measurements within subjects when at different stimulation frequencies. This is keeping with understanding of the neuronal and systems level effect that it is thought to have, namely that low frequency stimulation is excitatory and high frequency stimulation mimics lesioning and thus is inhibitory.

Conclusions

Neuromodulation at different central targets has differing effects on the sensation of breathlessness and the objective parameters of breathing.

Learning Objectives

Neuromodulation at different central targets has differing effects on the sensation of breathlessness and the objective parameters of breathing.

References

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