

Abstract

Body weight changes have been described in the course of Parkinson's disease (PD) as well as following bilateral deep brain stimulation of the subthalamic nucleus (STN DBS) performed in advanced PD. According to the literature weight changes occur in 50-100% of patients who undergo STN DBS. In the last 15 years extensive efforts have been put in understanding the underlying mechanisms behind the weight changes following STN DBS in advanced PD patients however many sources still report conflicting evidence. Improved motor status, reduction in dyskinesias, decrease in energy expenditure, dopaminergic medication reduction, modification of food intake, hormonal factors, regional effects of stimulation were all speculated to cause this weight gain. We hypothesized that patients who underwent STN DBS procedure in our center would gain weight as reported in the literature (study 1, study 2). The etiology of post STN DBS weight gain has not been fully elucidated up to date, in our second study we further hypothesized that the weight changes are due to dysregulation of food related hormones and parameters (study 2). In the third study we hypothesized that weight gain is associated with position of active electrode contact (study 3).

Aims of the study: The primary aims of our studies were to assess body weight changes and related anthropometric parameters following STN DBS in PD (study 1 and 2), to explore regulation of energy homeostasis and food intake by assessment of laboratory parameters involved in body weight and energy metabolism homeostasis, and to assess whether weight gain observed is dependent on the active electrode contact position in STN, particularly with respect to mediolateral direction (study 3).

Methods and results: Study 1. Retrospective survey in the form of structured questionnaire, was used to evaluate body weight changes in our patients with

advanced PD treated with STN DBS and the survey was repeated year later from the first one. Significant weight gain was found in all patients comparing to pre-DBS period. In the repeated survey only few patients increased further body weight. Study 2. Anthropometric parameters and food- related hormones such as leptin, adiponectin, resistin, ghrelin, cortisol, insulin, and thyroid stimulating hormone were repeatedly measured during a 12 months period following electrode implantation. On average we found increases in body weight, BMI, waist circumference and body fat percentage during the entire study period. The significant weight change was already apparent in the first month following the surgery. No significant changes were found in food related hormones and biochemical parameters compared to baseline except a significant decrease in cortisol levels. Thus, we concluded, that changes in traditional peripheral food related hormones do not appear to be cause of weight gain in STN DBS treated PD patients. Study 3. T1 weighted magnetic resonance images were acquired one year after DBS implantation and electrode position within the STN was established. We found that weight gain was inversely related to distance of contacts from the wall of third ventricle and the patients who had at least one contact located medially gained significantly more weight than those with both active contacts located laterally.

Conclusions: In our studies we have confirmed post STN DBS weight gain associated with changes in corresponding anthropometric parameters. Our observations conclude that the weight changes are not caused by dysregulation in traditional peripheral food related hormones and parameters, however we further discovered that patients with at least one contact positioned medially within the STN encountered significantly higher weight gain that those patients with both active contacts localized laterally.

Key words: Parkinson's disease, deep brain stimulation, subthalamic nucleus, weight gain, food intake hormones