



Weight changes in Parkinson's disease patients after subthalamic nucleus deep brain stimulation surgery

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Abstract

Background: After Sub-Thalamic Nucleus Deep Brain Stimulation (STN-DBS), an effective treatment for Parkinson disease patients, weight gain has been observed. As this method of treatment is only in use since two years in Iran, no information regarding its side effects (including weight gain) existed thus far.

Objective: We conducted this study to evaluate the weight gain 1 and 3 months after the DBS surgery.

Methods: We enrolled all patients who underwent bilateral STN-DBS in Rasool Akram Hospital affiliated to Iran University of Medical Sciences in 2008- 2009. Unified Parkinson Disease Rating Scale (UPDRS), neuropsychological assessment, pulmonary and cardiac evaluation before the surgery were carried out for all patients. They were weighted before, 1 and 3 months after the STN-DBS.

Results: The average weight of patients was 70.7 ± 14.4 , 74.1 ± 16.2 and 76.6 ± 14.4 Kg before, 1 and 3 months after the STN-DBS, respectively ($P < 0.037$).

Conclusion: Our results confirm that rapid weight gain (as soon as 1 month after surgery) occurred in STN-DBS treated parkinsonian patients.

Key words: Parkinson's disease; DBS; weight changes; sub-thalamic nucleus.

Introduction

Parkinson's disease (PD) is a progressive clinical syndrome associated with pathological changes in the Substantia Nigra Pars compacta ("SNc") (1). PD management has improved over the years but at first had included symptomatic therapy (2). Medical and surgical methods were used for treatment of the disease. Deep Brain Stimulation ("DBS") is a surgical method employed for the treatment of PD which is effective in improving the quality of life (3), and lowering of the rigidity; tremor, bradykinesia (4, 5) and drugs usage (6, 7). The preferred method for DBS is sub-thalamic nucleus stimulation (STN-DBS) (8).

Although STN-DBS has good therapeutic effect for PD, weight gain has been reported as a side effect of this procedure by some researchers.

However, this complication can not be associated with dysphagia reduction, more feeding or appetite improvement (9).

Becoming over-weight, and indeed obese, is not only a significant risk factor for many disorders (10), additionally, it can lead to hypoactivity in DBS-STN patients (11), too. As such, weight control must be considered as a crucial treatment factor. Although a number of studies have already been conducted on body weight changes in STN-DBS patients, due to the inherent relative new history of this therapeutic treatment in Iran, very little information regarding its side effects is available. Accordingly, this study measures the weight changes in STN-DBS patients in a major center of Neurology of Iran.

Subjects and methods

All patients who underwent STN-DBS in the Rasool Akram hospital over the course of 2008-2009, i.e. 15, were included in this study. The institutional review board of research approved the study and all patients gave their written informed consents.

Primary evaluation of patients was done with Unified Parkinson's Disease Rating Scale ("UPDRS"). A 30% margin in the "on" and "off" states of the patients considered for surgery was applied. Three patients had dyskinesias (all male) the severity of which was evaluated by the Unified Dyskinesia Rating Scales (UDysRS) before and after surgery.

Other criteria for STN-DBS surgery included normal neuropsychological examination, response to levodopa, normal pulmonary and cardiac assessment, absence of cortical atrophy and white matter lesions in brain MRI. In all patients, STN-DBS was performed bilaterally.

Weight of all patients was measured in light clothes and without shoes by one Seca scale. The patients had not received any dietary regimen or specific drugs.

Data analyses

The data was analyzed using SPSS software (Version 15). Mean value and standard deviation of weights were compared with Paired T test.

Results

Fifteen patients were included in this study (14 male and 1 female). The average duration of Parkinson's disease was 8.5 ± 1.5 years (minimum 6 years and maximum 12 years); the mean age of the patients was 51.8 ± 8.3 years (minimum 38 years and maximum 69 years).

The change in mean weight of Parkinsonian patients before, 1 and 3 months after surgery is shown in table 1. The average weight of the patients was 70.7 ± 14.4 , 74.1 ± 16.2 and 76.6 ± 14.4 Kg before, one month and three months after the STN-DBS, respectively. The weight changes were significant as soon as 1 month after surgery ($P < 0.001$) when weight had increased by 3.3 ± 2.6 Kg. At 3 months the weight increase was 5.9 ± 3.7 Kg ($p = 0.037$). Figure 1 shows the average weight gain during the course of this study.

Dyskinesias were present on average less than 25% of "on" time and their severity was mild (Prat 1 UDysRS: mean score ≤ 1). There was no significant change in the dyskinesia score after STN-DBS surgery.

Table 1

Comparison of mean value of Parkinson's patients' weight before, 1 and 3 months after surgery

Time (Month)	Mean \pm SD (Yr)
0	70.7 ± 14.4
1*	74.1 ± 16.2
3**	76.6 ± 14.4

* P value of paired T test between 0 and 1 month after surgery is < 0.001

** P value of paired T test between 0 and 3 months after surgery is < 0.001

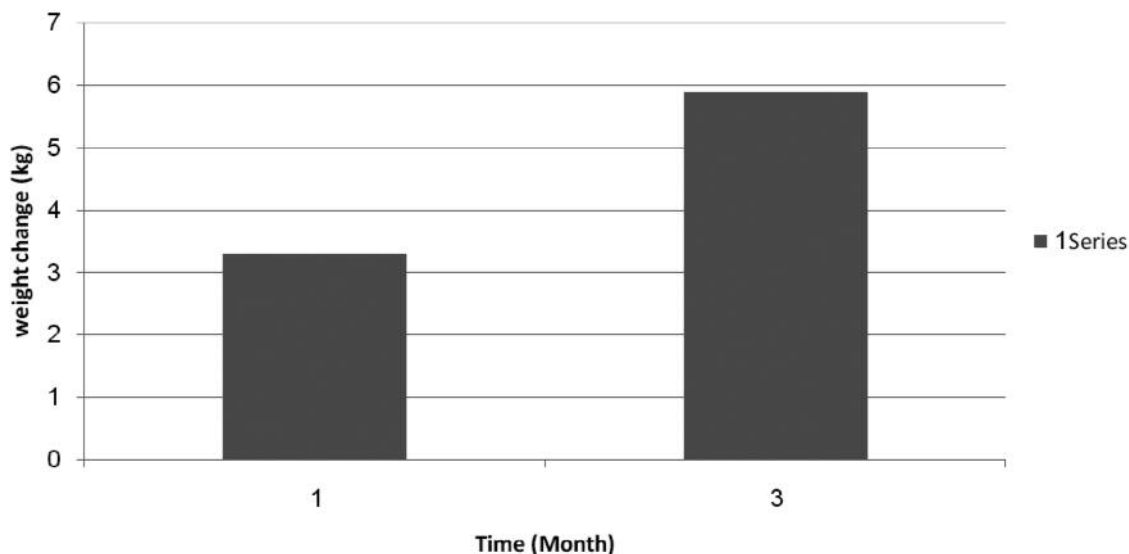
*** P value of paired T test between 1 and 3 months after surgery is < 0.037 .

Discussion

STN-DBS is a functional neurosurgery treatment for PD that has been proven to induce symptomatic improvement (3-7, 15).

As already mentioned, STN-DBS is relatively new to Iran and has only been performed since two years. This treatment is therefore considered as a new therapy, and this study is the first weight change evaluation in these patients.

The participants of our study gained an average of 3.3 ± 2.6 Kg after the first month and 5.9 ± 3.7 Kg after 3 months of STN-DBS. The majority of STN-DBS studies in parkinsonian patients showed weight gain after the surgery, although the average change differs between them. For instance, Harison *et al.* found that 12 month after STN-DBS a mean weight increase of 4.3 ± 7.2 Kg (12). A study in France showed that 70% of STN-DBS patients had gained weight by the third month (13) while in an Italian



investigation significant increase in weight (mean $14.8 \pm 9.8\%$) occurred after one year and in 46.9% of patients within the first 3 months (10). In another study, weight gain of about 4.7 Kgs was reported after 12 months of STN-DBS (14). None of the published studies showed a significant weight gain within the first month after the surgery. For instance, Tuite *et al.* found no significant post-operative weight gain within 0-1.5 month (2).

Consequently, an important novel finding in our study is the rapid increase in weight we observed within the 1st month after surgery in Iranian patients. It remains to be determined if this is related to the dietary habits of Iranians or to DBS-induced changes in the hypothalamic appetite center. The majority of the investigations on weight gain in STN-DBS patients considered that this side effect could be a homeostatic response to weight-loss prior to surgery (13). However, in some studies (10) a correlation was found between weight gain and dyskinesia score, suggesting that the weight gain after STN-DBS may be due to the reduction in energy expenditure related to dyskinesias (11). In our study only three patients had on-dyskinesias and there was no significant change after surgery.

It has been suggested that rapid body weight gain increases cardiovascular risk factors in former male athletes (16) and generally speaking overweight predisposes to several diseases including diabetes mellitus, cardiovascular disease, osteoarthritis and gallbladder disease (10).

In our study there is no relationship between age and weight gain. Since 14 out of 15 patients were males, we were unable to evaluate the possible correlation weight gain and gender.

We conclude therefore that STN-DBS treated parkinsonian patients are likely to experience weight gain rapidly after electrode implantation in Iran. We plan to continue this study for a longer period (at least for 1 year), paying attention in particular to changes in lifestyle and dietary habits of patients.

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