ASSESSMENT OF DAILY LIVING ACTIVITY AND QUALITY OF LIFE IN PATIENTS WITH PARKINSON DISEASE*

EVALUAREA ACTIVIŢII ŞI CALITĂŢII VIEŢII DE ZI CU ZI A PACIENŢIILOR DIAGNOSTICAŢI CU BOALA PARKINSON*

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Key words: Parkinson's Disease, Quality of Life, Activity of Daily Living.

Abstract.

Purpose: The aim of this study was to assess the daily living activity and quality of life in patients with Parkinson's disease.

Materials and methods: Twenty patients who underwent subthalamic nucleus deep brain stimulation (STN DBS) were assessed before surgery, at third month and at six month after surgery. Quality of life was assessed using SF-36 survey. Unified Parkinson's disease Rating Scale (UPDRS) was used to define severity of the Parkinson's disease. Hoehn &Yahr Scale and activity of daily living (ADL) were also used.

Results: The mean age of the patients was 55.05±9.07 years. The results of this study showed that UPDRS total scores were found after surgery compared with before surgery (p=0.000). There were a statistics differences between pre and after surgery in subscales SF-36 that energy level (p=0.000), social functioning (p=0.001), physical functioning (p=0.000) and general health perceptions (p=0.000). There were also differences in ADL (p=0.000) and H&Y score (p=0.000).

Conclusion: The results of the study showed that Bilateral STN DBS is an effective and safe treatment to improve both activities of daily living and the quality of life in patients with Parkinson's disease.

Cuvinte cheie: boala Parkinson, calitatea vieţii, stimulare cerebrală profundă bilaterală

Rezumat.

Scop: Scopul acestui studiu este de a evalua activitatatea zilnică şi calitatea vieţii la pacienţii cu boala Parkinson.

Material şi metodă: Douăzeci de pacienţi care au suferit stimulare cerebrală profundă a nucleului subtalamic (STN DBS) au fost evaluaţi înainte de intervenţie, la 3 şi 6 luni după intervenţie. Calitatea vieţii a fost evaluată cu ajutorul chestionarului SF-36. Pentru a evalua severitatea bolii Parkinson s-a folosit Unified Parkinson's disease Rating Scale (UPDRS). S-au mai folosit Hoehn &Yahr Scale şi ADL- urile.

Rezultate: Media de vârstă a pacienţilor a fost de 55.05±9.07 years. Rezultatele acestui studiu au demonstrat că scorul total al UPDRS a fost mai mare după intervenţie comparat cu cel iniţial (p=0.000). Au existat dferenţe statistice semnificative între scorurile obţinute pre şi post la subscalele chestionarului SF-36 referitoare la nivelul de energie (p=0.000), funcţia socială (p=0.001), funcţia fizică (p=0.000) şi percepţia privind starea de sănătate (p=0.000). S-au constatat diferenţe între scorurile pre şi postoperatorii ale ADL (p=0.000) şi H&Y (p=0.000).

Concluzii: Rezultatele studiului au arătat că stimularea cerebrală profundă bilaterală constituie un tratamemt eficient şi sigur în îmbunătăţirea activităţilor zilnice şi a calităţii vieţii pacienţilor cu boala Parkinson.

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Introduction

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Parkinson's disease (PD) is a neurodegenerative disorder, that results from progressive death of nervous cells from substantia nigra (1). These cells are responsible with the production of dopamine. Dopamine was identified as an important inhibitor for prolectine release by anterior pituitary gland. Therefore, dopaminergic antagonists and dopamine precursors were developed in order to treat neuroendocrine disorder, which implies abnormal prolectine release, and for treating PD (2,3).

Cell degeneration from substantia nigra leads to loss of dopamine, thus patients with PD are suffering from: decreased mobility, tremor, rigidity, akinesia / bradykinesia, memory loss. Patients with Parkinson's disease suffer from nervous breakdown, their incidence being linked to duration and severity of PD, and also from the use of multiple medications (4). All these symptoms have a major impact on quality of life and activities of daily living in patients with Parkinson's disease (5,6). Symptoms can be relieved by medication, but there is no cure for slowing down or stopping the illness (2).

Quality of life is a very important aspect for patients with PD, because it can be affected by factors like depression, level of human interaction, cognitive impairment. Postural instability can affect patients capacity of maintaining balance during activities of daily living (ADL), therefore decreasing the quality of life in patients with PD (7,8).

The aim of this study was to assess the activities of daily living and quality of life in patients with Parkinson's disease, following bilateral deep brain stimulation.

Methods

Patient group

Twenty (9 males/11females) patients with Parkinson's disease enrolled in this study, average age 55.05 ± 9.07 years. All gave their informed consent to participate in this study. This manuscrupt was conducted in accordence with decleration of Helsinki. The data were collected between May 2009 and April 2011. The selection criteria were; (1) clinically diagnosed Parkinson's disease, (2) no surgical contraindications, (3) no dementia or major ongoing psychiatric illness and (4) without any other neurological disorders. Patients caracteristics are summarized in Table I.

Table I. Patients Characteristics

Variables	Min-Max	X±SD
Age (yr)	37.00 – 72.00	55.05 ± 9.07
Height (cm)	150 – 180	163 ± 0.08
Weight (kg)	47.00– 104. 00	68.57 ± 15.30
BMI (Kg/m^2)	17.72 – 37.78	25.65 ± 6.09
Duration of disease (yr)	3.00 – 25.00	12.57 ± 5.90
Duration of using levodopa (yr)	3.00 – 25.00	12.00 ± 5.91
Equivalent daily dose of LED (mg)	0-1500	648.68 ± 446.93

Surgery procedure

Surgery procedure relies on implantation of microelectrodes, under anesthesia, in different structures of the brain. The electrodes are linked to two wires (lead and extension) and a neurostimulator. The neurostimulator delivers continuous electrical impulses to these tiny electrodes. Wires are implanted bilaterally. The lead wires have an intracranial portion and the other components are implanted subcutaneously (9).

All STN DBS procedures were performed by one neurosurgeon in two stages: (1) insertion of bilateral electrodes under local anesthesia using microelectrode recording, and (2) connection of the electrodes to pulse generators under general anesthesia, performed approximately 1 day after lead placement. The subthalamic nucleus was localized stereo

tactically by magnetic resonance imaging (MRI), and microelectrode recordings were performed to define STN. The quadripolar electrodes (Medtronic 37601 Activa PC) were implanted bilaterally in all patients. Clinical effect on rigidity and tremor was tested under stimulation using a macroelectrode. All patients underwent MRI postoperatively for the assessment of surgical complications. A programmable pulse generator was implanted subcutaneously under general anesthesia on the second day after implantation of the electrodes. Stimulation settings and medication were progressively adjusted (10).

Assessment Procedures

Patients were assessed before intervention, and at three and six month after surgery. Unblinded assessments were performed when patients had taken no medication for 8 to 12 hours (off medication) in order to show the benefits of the DBS STN. Postoperatively, patients were assessed during on stimulation. Quality of life was assessed using SF-36 Quality of Life Questionnaire. Unified Parkinson's disease Rating Scale (UPDRS) was used to define severity of the Parkinson's disease. Hoehn &Yahr Scale and Activity of Daily Living (ADL) were also used.

Unified Parkinson Disease Rating Scale (UPDRS)

Patients were clinically assessed using the UPDRS. Different scores were extracted from this scale: the psychological status (items 1 and 4 of the UPDRS I), the daily living activities (ADL) score (items 5 and 17 of the UPDRS II), the motor score (items 18–31 of the UPDRS III, including gait and postural stability parameters), the dyskinesias score (items 32–35 of the UPDRS IV), the total UPDRS score comprised between 0 and 108, maximal worst value=108 (10).

Hoehn&Yahr Scale (H&Y)

H&Y is a commonly used system for describing how the symptoms of PD progress. The H&Y original scale included stages 1 to 5 with Stage 0: no signs of disease, stage 1: unilateral symptoms only, stage 2: bilateral symptoms and impairment of balance, stage 3: balance impairment, mild to moderate disease and physically independent, stage 4: severe disability, but still able to walk or stand unassisted, stage 5: needing a wheelchair or bedridden unless assisted (11).

Activities of Daily Living Questionnaire

This is a 24 item self-rated scale, covering various aspects of everyday life likely to be influenced by a chronic illness such as Parkinson's disease. Items cover activities involving manual dexterity for example "cut food with a knife and fork" to mobility for example "get up from a chair". Subjects were asked to rate their ability to perform each activity on a 5 point scale from l-"alone without difficulty" to 5-"unable to do". The minimum score meaning best performance is 24 and maximum total score is 120 points, and higher score reflect bad performance (12, 13). The subscales items are presented in Appendix A.

36 – Item Short Form Health Survey (SF-36*)*

SF-36 is the most widely used HRQOL survey instrument in the United States (14, 15). The SF-36 includes eight health concepts judged as the most affected by disease and treatment, selected from 40 concepts assessed in the Medical Outcome Study (15). These subscales are physical functioning, role limitation, bodily pain, social functioning, general mental health, role limitation due to emotional problems, energy level and general health perception. The assessment was done on long term (from preoperative stage to three and six month after surgery).

Statistical Analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS version 13.0). The Kolmogorov- Smirnov Test was used to normality distribution and all data were parametric. The Repeated Measures ANOVA test was applied to compare the mean scores of three assessments (preoperatively, postop 3^{th} month and postop 6^{th} month). In addition to this, a Paired t- test was also used to compare the results being taken

during preoperative stage, postop 3th month and postop 6th month. A level of $p<0.05$ was considered significant.

Results

The ADL and SF-36 subscales scores significantly improved in postop 3th month and postop 6th month. At the same time, UPDRS total and - H&Y scores significantly decreased 6 month after surgery (Table II).

Results of this study show that ADL and patient's quality of life significantly improved in the third and sixth month after surgical procedure ($p<0.05$). There were significant diferences between preoperative and third month assessments after surgery, also between preoperative and sixth month assessments after surgery, and also between the third and sixth month after surgery, in SF-36 subscales (Table III), especially regarding the energy level (p=0,000), social functioning (p=0,001), physical functioning (p=0,000) and general heath perception (p=0,000).

The Quality of life score was significantly improved between the three assessments ($p<0.05$). The daily living activity scores were significantly improved ($p<0.05$) after surgery. UPDRS test score was significantly better ($p<0.05$) after surgery. (Table III)

Compared to the preoperative baseline, third month and sixth month scores, the quality of life scores and daily living activity significantly improved (p=0.000) (Table III). H&Y score was decreased six month after surgery ($p<0.05$).

Discussion

In patients with Parkinson's disease who underwent subthalamic nucleus deep brain stimulation, significant postoperative improvements were shown in all aspects of their quality of life. Comparing to baseline, these improvements have lasted for six months after surgery, as the results reveal. The mean scores of health related quality of life assessment are shown in table II.

Deep brain stimulation (DBS) of subthalamic nucleus is the preferred surgical approach for patients with PD. Despite the limitations of the published studies, there is growing evidence that DBS has a favorable impact on health related quality of life in patients with PD and other movement disorders (6).

Just H. and Ostergaard K. found in their study that patients with advanced idiopathic PD treated with DBS of the STN obtained significant improvements in patient reported HRQOL and in clinical outcomes 3 and 6 months after surgery. They found that UPDRS scores improved significantly from baseline to three and from baseline to six month for the surgery group but not for the nonsurgery group (8). Regarding UPDRS, we found that baseline total score indicate worse performance (97.45±36.87). After surgery, the mean scores significantly reduces from baseline to 3 month (63.70±19.22) and 6 month (38.60±18.66). This means that six month after surgery, patients' performance improved even more.

According to Hoehn&Yahr Scale, prior to surgery patients had severe disability, able to walk and stand unassisted (3.95±0.60). Three month after surgery, patients presented mild bilateral disease, with recovery on pull test, and after six month (2.65±0.58), they presented bilateral disease with no impairment of balance (2.45±0.95). Comparing the baseline with third and sixth month after surgery there are significant differences between the two assessments using H&Y Scale (p=0.000), but from three to six month, there was no notable improvement (p= 0.297) (Table III).

Regarding the activities of daily living, at baseline, both gross and fine activities were severely impaired (34.05±14.56, respectively 41.60±18.04), but they improved at three and six month after surgical intervention (Table II). The best improvement was shown in fine activity (from 41.60±18.04 to 30.80±15.91 and then to 23.95±16.04). The ADL average total score was close to the upper limit, showing a poor performance in preoperative stage (75.65±31.88). After surgery, the average score was decreasing constantly to three (60.55±29.37) and six month (48.20±28.48). There were significant differences between baseline and three and six month after intervention, but also from three to six month after brain stimulation (p=0.000) (Table III).

Quality of life was assessed also using SF-36 Health Survey. Leonardi M. found that in patients with Hoehn & Yahr stage <3 and ≥3, SF-36 score are significantly worse than normative values (16). In our study, baseline SF-36 score in all eight scales were very low, indicating a very poor quality of life.

Results show that physical functioning has a very low level (28.10±30.23) at baseline, but it is improved three months after surgery. At six months, patients' physical functioning was good. Role limitation subscale vas very poor at baseline (3.00±7.32), was improving after surgery but not sufficient to increase enough the patient's quality of life (37.37±03.03). Patients complain a lot of pain prior to surgery (36.95±30.59), but after intervention pain continuously was decreasing at three (53.47±28.68) and six month (61.55±32.86). Emotional aspect has a major role in the level of life quality, due to baseline scores (6.66±14.45) which are close to the lower score possible (Table III). But deep brain stimulation is a very effective procedure regarding emotional status, as shown by Wang at al. who stated that the improvement in motor function will reduce depression, but not on long term (17). Baseline scores for social functioning, general mental health, energy level and general health perceptions showed a poor level of quality of life. After deep brain stimulation all of these aspects were improved. Comparing the baseline scores with three and six month after surgery, there were significant differences (p=0.000) especially in physical and social functioning and also in energy level and general health perception (Table II).

Table II. UPDRS, H&Y, Quality of Life and Daily Living Activity Assessment

Variables	Preop (N=20)	Postop 3th month (N=20)	Postop 6th month (N=20)	F	P*
UPDRS total	97.45±36.87	63.70±19.22	38.60±18.66	33.92	**0.000**
H&Y	3.95±0.60	2.65±0.58	2.45±0.95	53.25	**0.000**
Daily living activity (Total)	75.65±31.88	60.55±29.37	48.20±28.48	72.48	**0.000**
Gross activity	34.05±14.56	29.75±14.35	24.25±13.90	59.25	**0.000**
Fine activity	41.60±18.04	30.80±15.91	23.95±16.04	40.63	**0.000**
SF- 36					
Physical functioning	28.10±30.23	47.90±26.35	73.50±22.07	40.72	**0.000**
Role limitation	3.00±7.32	14.87±16.29	37.37±03.03	19.22	**0.000**
Bodily Pain	36.95±30.59	53.47±28.68	61.55±32.86	13.76	**0.000**
Social functioning	29.37±27.33	46.10±23.63	64.67±24.55	29.98	**0.001**
General mental health	45.32±20.06	51.12±17.37	69.92±13.78	37.67	**0.000**
Role limitation due to emotional problems	6.66±14.45	21.35±26.92	45.12±35.34	17.50	**0.000**
Energy level	39.62±12.36	52.50±11.41	65.30±13.21	59.62	**0.000**
General health perceptions	38.50±8.44	53.40±13.92	69.50±15.20	55.33	**0.000**

***Repeated Measures ANOVA**

Table III. UPDRS, H&Y, Quality of Life and Daily Living Activity Assessment

Variables	Preop – postop 3th month		Preop - postop 6th month		Postop3th – 6th month	
	t	P*	t	P*	t	P*
UPDRS total	5.85	**0.000**	6.37	**0.000**	4.19	**0.000**
H&Y	10.17	**0.000**	9.74	**0.000**	1.07	0.297
Daily living activity	6.17	**0.000**	10.26	**0.000**	7.79	**0.000**
Gross activity	4.59	**0.000**	11.64	**0.000**	5.92	**0.000**
Fine activity	5.03	**0.000**	7.11	**0.000**	7.09	**0.000**
SF- 36						
Physical functioning	-6.48	**0.000**	-7.04	**0.000**	-5.07	**0.000**
Role limitation	-3.32	**0.004**	-4.93	**0.000**	-3.86	**0.001**
Bodily Pain	-3.27	**0.004**	-4.36	**0.000**	-2.39	**0.027**
Social functioning	-8.11	**0.000**	-6.04	**0.000**	-3.78	**0.001**
General mental health	-1,64	0.117	-8.83	**0.000**	-7.60	**0.000**
Role limitation due to emotional problems	-2.50	**0.022**	-4.88	**0.000**	-4.16	**0.001**
Energy level	-6.14	**0.000**	-11.52	**0.000**	-4.75	**0.000**
General health perceptions	-6.60	**0.000**	-8.92	**0.000**	-5.39	**0.000**

*** Paired t- test.**

Conclusions

Our study reveals that selected patients with PD who underwent deep brain stimulation had improved their gross and fine motor activity. Also, they had better physical and social functioning, less pain, a better level of energy and a good general health perception, both at three and six month after intervention. All these aspects lead to an improved quality of life in patients with PD. Surgical therapy is an effective treatment to improve quality of life and activities of daily living in patients with Parkinson's disease.

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Appendix A. Activities of Daily Living Questionnaire

Gros Mobility	1(good)	2	3	4	5(bad)	Fine Activity	1(good)	2	3	4	5(bad)
a-stair climbing						a-water filling					
b-exit the bathroom						b-use the telefone					
c-riding the bus						c- brushing teeth					
d-enter a bathtub						d-tea filling					
e- stund up the chair						e- face wash					
f- sightseeing store						f- dish washing					
g- get in stairs						g- food cutting					
h-get up the bed						h- Insert the socket					
I-get on the place						I- glass transport					
j-travelling in the house						j- wear					
k- removing clothes						k-opening the jar					
Total	11				55	l- placement of newspaper					
						m-write the letter					
						Total	13				65
Total score: Gros mobility (11) + Fine mobility (13) = 24 (best) Gros mobility (55) + Fine mobility (65) = 120 (worse)											