

## Clinical Experience from Turkey in Rehabilitation of Parkinson's Disease after Deep Brain Stimulation: What are we Doing?

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### Abstract

Motor symptoms in Parkinson's disease from the early stages of the disease affect balance and mobility. Functional disorders caused by clinical symptoms lead to deterioration in activities of daily living and quality of life, depending on the severity of disease. The physiotherapy program to be applied according to the needs of the patient in different phases of Parkinson's disease will also vary. Beginning the physiotherapy program in early stages of disease may help to avoid problems that lead to dependence, inactivity, social isolation and reduced quality of life. Rehabilitation starting in the early postoperative period prolongs the effectiveness of deep brain stimulation. Physiotherapy improves both activities of daily living and the quality of life as well as motor symptoms after surgery.

**Keywords:** Parkinson's disease; Deep brain stimulation; Physiotherapy

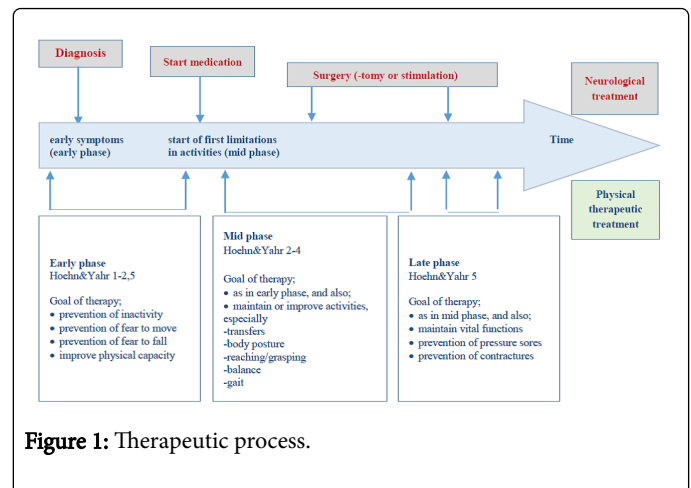
### Introduction

Motor symptoms in Parkinson's disease from the early stages of the disease affect balance and mobility despite optimal medical approaches [1]. Decreases in physical capacity and side effects of medications can lead to the level of disability over time. In addition, severe complications such as falls and fall-related fractures due to loss of postural reflexes and pneumonia secondary to immobilization occur in the later stages of disease [2].

Functional disorders caused by clinical symptoms lead to deterioration in activities of daily living and quality of life, depending on the severity of disease. The physiotherapy program to be applied according to the needs of the patient in different phases of Parkinson's disease will also vary. Information about treatment process of the patients at different stages is summarized (Figure 1) [3].

Physiotherapy approaches, including exercise programs, play an important role in treatment of Parkinson's disease [4]. Increasingly, exercise programs have been shown to be highly effective in reducing functional deficits [5]. The most important goal of the rehabilitation program is to increase the mobility and functional capacity of the patient, to increase the quality of life, and to make social life return by increasing the level of independence.

Physiotherapy and rehabilitation programs should not only aim to treat the functions that are impaired but also to prevent the problems that will arise. Beginning the physiotherapy program concurrently with the treatment of the disease from the early stages of the disease may help to avoid such problems that lead to dependence, inactivity, social isolation and reduced quality of life [6,7].



### Preoperative Phase

The aim of physiotherapy and rehabilitation in preoperative stage is to prepare the patients who undergoing DBS. The goal of physical therapy program are; improve the respiratory function and to prevent respiratory complications, decrease rigidity, reduce the pain, maintain independence, improve the flexibility; optimize gait, to recommended assistive devices, maximize gross motor coordination and balance, provide the safe ambulation, educate and guide care giving needs [8-11].

The first step of preoperative evaluation is to inform the patient and his/her family about the possible complications of the surgeon. The evaluation procedure to be performed before determining the appropriate rehabilitation program for the patient includes balance, mobility, tremor, rigidity, coordination, speech, evaluation of hand functions, activities of daily living, environmental assessment, assistive device selection [12].

## Postoperative Phase

After surgery, patients are assessed at first 24 hours following the battery setting. Parkinson's disease has respiratory failure due to flexure posture, kyphosis and rigidity. After surgery, physiotherapy

begins with breathing exercises. Respiratory exercises, postural alignment exercises, and thoracic extension exercises are effective for increasing respiratory capacity [12-14]. Postoperative evaluation and physiotherapy program to be performed are given (Figure 2).

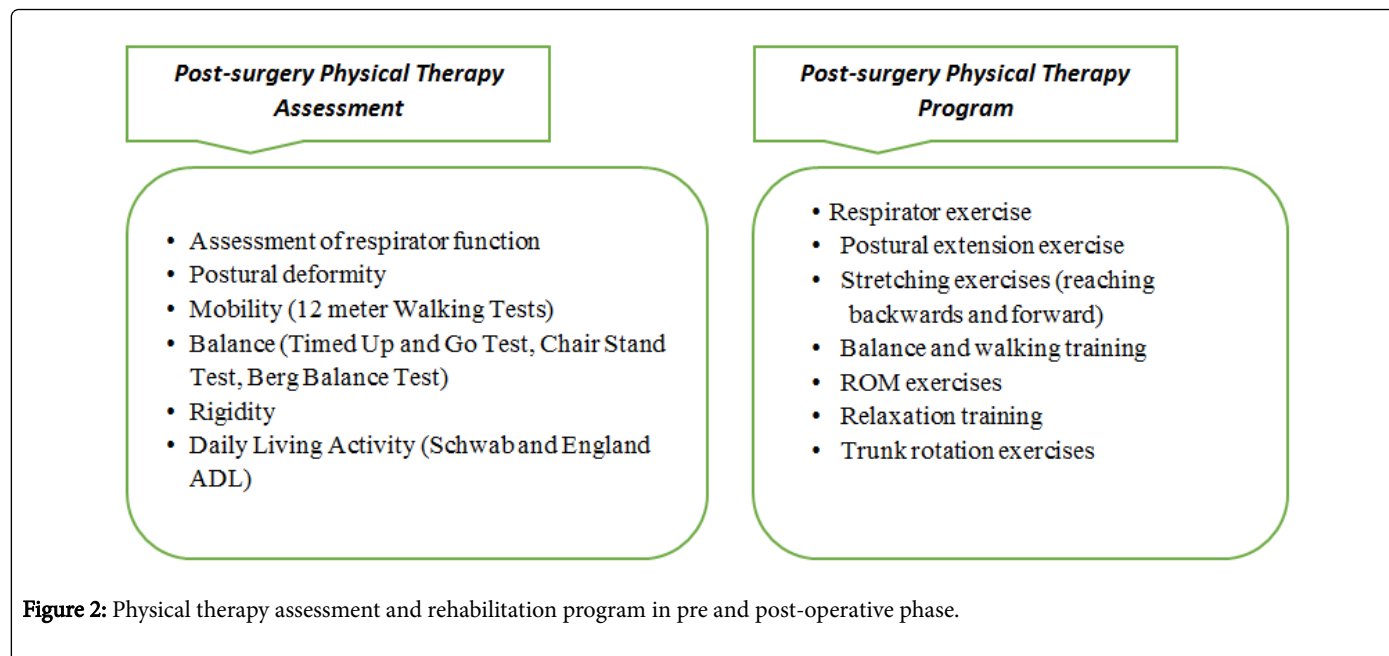


Figure 2: Physical therapy assessment and rehabilitation program in pre and post-operative phase.

In order to reduce postural disturbance and balance problems, the patient should be taught the correct posture. Postural extension exercises and trunk rotation movements should be applied. In order to prevent falls, the patient should be instructed to rotate around a large

arc by correctly positioning the foot and increasing visual and verbal stimuli, while walking. Walking with a rhythm and proper walking with arm swings should be taught to prevent freezing [12,9] (Table 1).

| Parameters                       | Goal   | Strategy   |
|----------------------------------|--|--|
| <b>Stimulation of activities</b> |  |  |
| Transfers                        | Perform transfers (more) independently   | Practice transfers by using cognitive movement strategies and on/off cues for movement initiation  |
| Body posture                     | Conscious normalization of body posture  | Practice relaxed and coordinated moving; providing feedback and advice   |
| Reaching and grasping            | Improve reaching and grasping, and manipulating and moving objects   | Practice reaching and grasping by using cues and cognitive movement strategies   |
| Balance                          | Improve balance during activities  | Practice balance, train muscle strength (see prevention of falls)  |
| Gait                             | Improve walking (independently); the objective is to increase the (comfortable) walking speed; however, safety comes first | Practice walking by using cues for initiation and continuation of walking, give instruction and train muscle strength and trunk mobility   |
| <b>Prevention</b>                |  |  |
| Inactivity                       | Preserve or improve physical condition   | Provide information on the importance of moving and playing sports, training of physical capacity; muscle strength (with the emphasis on trunk and leg muscles); aerobic capacity; and joint mobility (among others thoracic kyphosis, axial rotation and length of muscles of calf and hamstrings)    |
| Pressure sores                   | Prevention of pressure sores   | Give advice and adjust the patient's body posture in bed or wheelchair (possibly in consultation with an occupational therapist); (supervised) active exercises to improve cardiovascular condition and prevention of contractures   |
| Falls                            | Decrease or prevent falls  | List possible causes of falls by means of falls diary; provide information and advice; train strength, body posture, coordination and balance, attuned to the cause of problems with maintaining balance and the increased falls risk; decrease the fear to fall (if necessary) provide hip protectors |

Table 3: Treatment strategies.

In Parkinsonian patients, speech problems are seen as a result of the fact that the respiratory frequency cannot be controlled at first, but later on, facial muscles are affected. Respiratory exercises, facial, oral and lingual muscle exercises should be performed in order to prevent aspiration by speech therapy and to ensure speech correctness [13]. The steps of the rehabilitation program that will occur after surgery are explained in detail [3].

### Recommendations for Patients and Family

Frequent rest periods should be given during exercises, excessive fatigue should be avoided.

The activities that patients should not do after surgery are as follows:

- Cervical manipulation, massage and excessive cervical exercise should be avoided.
- Upper limb activities above the head level should not be done.
- Do not lift more than 3-4 kg in the first month.
- Some medical devices such as MRI should not be used.
- Do not pass through electromagnetic gates.
- Wireless connections are dangerous for battery.
- Stay away from high-powered industrial machines.
- Simple sportive activities can be carried out, especially those that are not physically risky to crash and without contact with the tie or neurostimulator.

Rehabilitation practices should continue lifelong in Parkinson's disease [11]. In this regard, directing patients to activities such as walking and dancing to improve aerobic capacities will facilitate the maintenance of the rehabilitation program [14]. Patient and family should be made aware. The exercises and suggestions should be given as a home program, for this purpose [15,16].

### Our Clinical Experiences in Rehabilitation of Parkinson's Disease after DBS

In the light of all these information, let's look at the results of our studies. Nineteen patients (age range: 37 to 72 years) who underwent bilateral stimulation of the sub-thalamic nucleus were evaluated preoperatively and at the 5<sup>th</sup> day and 6<sup>th</sup> month after surgery. The stimulation was begun at the 2<sup>nd</sup> day after surgery (5<sup>th</sup> day) and we assessed all patients to show DBS's early effects. Additionally, we checked the long-term effects after surgery (6<sup>th</sup> month). All of the patients were included in physiotherapy program according to Hoehn et al. classification after surgery. Improvements in terms of mobility including gait and balance were observed [17]. We found similar results in a case of 67 year-old man with Parkinson's disease who has gait disturbance for eight years. Pedunculopontine Nucleus Deep Brain Stimulation (PPN-DBS) surgery was performed and gait parameters were evaluated by using foot print method. It was suggested that PPN-DBS surgery was an effective treatment to improve gait ability [18].

We reported also physiotherapy improves both activities of daily living and the quality of life as well as motor symptoms after surgery [19]. As a result, rehabilitation starting in the early postoperative

period prolongs the effectiveness of deep brain stimulation, as well facilitates adaptation to the patient's new clinical stage.

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