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## Physical therapy in Parkinson's disease: an open long-term rehabilitation trial

Received: 21 July 2003  
Received in revised form: 9 December 2003  
Accepted: 15 December 2003

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■ **Abstract** The aim of this study was to evaluate the effects of prolonged physical therapy on disability in patients with Parkinson's disease. The study was designed as an open long-term trial over 20 weeks. Twenty slightly to moderately affected parkinsonian patients were included (Hoehn & Yahr stages: 1.5–3). A comprehensive rehabilitation program was applied three times a week in all patients. Pharmacological treatment was kept stable. Evaluations were performed at baseline, at the end of treatment and after 3 months. Following

physical rehabilitation, there was a significant improvement in UPDRS (ADL and motor sections) scores, Self-assessment Parkinson's disease Disability Scale, Ten-Meter Walk test and Zung scale for depression. At 3-month follow-up clinical improvements were largely maintained. A sustained improvement of motor skills in PD patients can be achieved with a long-term comprehensive rehabilitation program.

■ **Key words** Parkinson's disease · long-term rehabilitation · UPDRS · depression

### Introduction

A number of intervention studies have been carried out to investigate the efficacy of physical therapy in association with pharmacological treatment in patients affected by Parkinson's disease (PD) [3, 4, 7, 11, 14, 15]. Although there is increasing evidence that well-focused physiotherapy can improve the patients' quality of life, there is no general consensus on the type of rehabilitation program most useful for patients with PD [5]. Moreover, most clinical trials of physical therapy in PD were based on short-term rehabilitation programs [3, 14, 17], and usually the improvements were not maintained after the physical therapy phase [3, 17].

The aims of our study were to evaluate the effects of long-term rehabilitation on PD disability by means of a specifically designed rehabilitation program, and to evaluate the ongoing effects of physical therapy after the active period with a long follow-up assessment.

### Methods

#### ■ Subjects

Twenty consecutive outpatients (12 men and 8 women, aged  $59 \pm 11.8$  years) with idiopathic PD [8] and modified Hoehn & Yahr stage 1.5–3 attending our movement disorder unit were enrolled in the study.

Mini Mental State Examinations score was  $>24$  in all patients. Mean (SD) disease duration was 4.8 (3.4) years. With respect to medications, 5 patients were taking a dopamine-agonist alone, 5 were taking levodopa alone, and 10 were taking levodopa in combination with a dopamine-agonist.

All pharmacological treatments were kept at a stable dosage for 30 days prior to study entry and throughout the study. All patients gave written consent to participate in the study.

#### ■ Rehabilitation program

The rehabilitation program included different sequences of exercises and was specifically designed to address three objectives: to improve motor skills, to correct abnormal postures and to increase motor dexterity. The program was administered by experienced physical therapists in an outpatient setting. Patients were individually treated.

To improve motor skills we proposed exercises of proprioceptive neuromuscular facilitation [10], and exercises of coordination for up-

per and lower limbs. Proprioceptive neuromuscular facilitation (PNF) is an established physiotherapy method that reportedly improves strength, coordination and speed of movements. PNF-based exercises have been previously used in PD with good results [3].

Postural abnormalities are a common feature of PD and contribute to impaired balance control and functional limitations. To correct abnormal postures we used exercises for stimulation of postural control according to Mezieres technique [12]. It is a global postural method commonly used in orthopedic rehabilitation that in our opinion may contribute to the recovery of the spinal and limb flexibility in PD.

To improve motor dexterity exercises of coordination for each limb and all limbs and exercises for stimulation of trunk control were performed in warm water (temperature ranging from 28 to 32 °C) to reduce muscle rigidity and increase muscle strength against the water resistance. Water therapy has not been systematically evaluated in PD, even if swimming and water exercises are often suggested in individual patients to build range of motion and facilitate active movements. Moreover external stimulation by water resistance may improve motor control and balance. Exercise sessions lasted 1 hour and occurred three times a week for 20 consecutive weeks. Each sequence of exercises was performed once a week.

#### Measures

All patients were evaluated by a neurologist with expertise in movement disorders. The assessment was made by means of the Unified PD Rating Scale [6] – ADL and motor sections – and the Self-assessment PD Disability Scale (SaPDDS) [1]. A Ten-Meter Walk test was also performed by instructing the subjects to walk at a comfortable pace over a 10-meter distance. Subjects completed two test trials and the data were averaged [16]. Depression was assessed by means of the self-rating depression scale by Zung [19].

All assessments were performed at baseline, at the end of the 20-week rehabilitation phase and 3 months later. To minimize the effects of medications on the patients' physical performance, the time of day of testing remained constant throughout the study.

Comparisons between the different evaluation times were performed by means of the Wilcoxon test.

## Results

All patients completed the study. There were no medical problems during the rehabilitation phase.

Mean (SD) UPDRS score for ADL section declined from 6.29 (3.8) at baseline to 4.7 (3.6) at the end of the rehabilitation phase ( $p=0.002$ ). Mean (SD) UPDRS score for motor section declined from 14.4 [7] to 10.6 (7.8) ( $p < 0.0001$ ) (Fig.).

Walking time at the Ten-Meter Walk test also decreased significantly (from  $11.2 \pm 2.7$  sec at baseline to  $9.8 \pm 1.8$  sec at the end of the rehabilitation phase;  $p=0.012$ ) (Fig.).

Following physical therapy, there was a significant improvement in SaPDDS score, that declined from 32.5 (4.17) to 29.2 (3.37) ( $p < 0.001$ ). Self-rating depression scale score was significantly reduced too (from  $31.7 \pm 8$  at baseline to  $27.8 \pm 6.1$  at the end of the rehabilitation phase;  $p < 0.0001$ ).

Three months following the rehabilitation phase there was a significant loss of regained motor skills only in UPDRS score for motor section ( $p=0.035$ ), but it re-

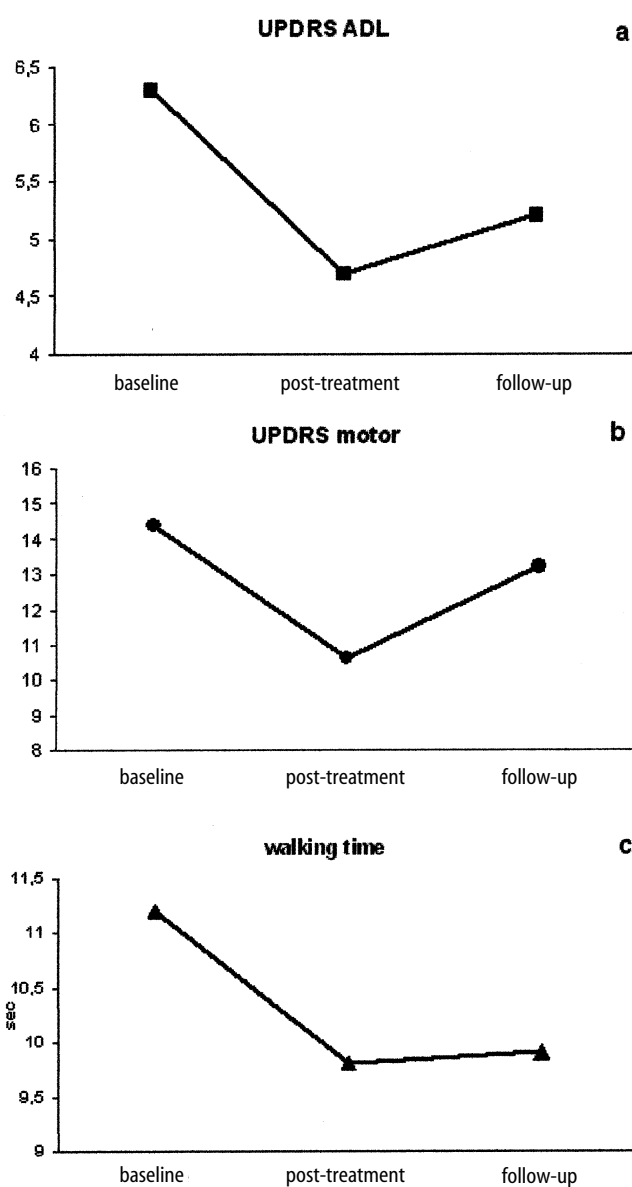


Fig. Influence of rehabilitation on UPDRS ADL (a) and motor (b) scores, and on walking time (c)

mained lower than baseline value. Improvements in UPDRS score for ADL section, Ten-Meter Walk test and SaPDDS were maintained 3 months after the rehabilitation phase. There was a trend to a loss of the effect on depression score 3 months after the rehabilitation phase ( $p=0.05$ ).

## Discussion

The lifelong management of PD patients needs a multidisciplinary approach including pharmacological and non-pharmacological interventions. A number of trials

have been carried out to investigate the efficacy of physical therapy in PD [3, 4, 7, 11, 14, 15]. Several methods, such as mobility exercises [3, 17], motor and gait training with external cues [11, 18], training of daily activities [9], relaxation techniques [13], karate exercises [14], have been employed in these trials and there is no general consensus on a rehabilitation program specific for PD patients.

In our study, we found that an eclectic combination of techniques opportunely employed in a long-term rehabilitation program is effective in improving PD-specific motor disability. It is difficult to make comparisons among studies on physical therapy in PD, since several different rehabilitation methods and measures have been employed. Moreover, few studies have been performed to assess the effects of long-term physical therapy in PD. Formisano et al. reported the beneficial effects of a 4-month rehabilitation program including active and passive mobilization in PD patients in both early and advanced phases of disease [7]. However, they did not perform a follow-up examination in their patients after the end of the rehabilitation phase. Palmer et al. reported an improvement of motor disability in PD patients after a 12-week exercise program and showed no difference in the outcome between karate training and a stretching program. A functional improvement was observed in gait, arm tremor and coordination, but the improvement was not maintained 6 months later [14]. Reuter et al. described the positive effects of a 14-week exercise training on motor disability and mood in PD patients [15]. In this study, the improvements in ADL and motor-UPDRS scores are consistent with our results, and a sustained ongoing effect outlasting the active training period for 6 weeks was achieved.

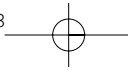
Our results suggest that a long-term comprehensive rehabilitation program may achieve a sustained improvement of motor skills in PD. In fact significant improvements in ADL and SaPDDS scores and in walking velocity were still observed 3 months after the rehabilitation phase. It is possible that patients need repeated inputs to sustain improvement in the face of a progressive deterioration. In most studies on physical therapy in PD, the follow-up period was shorter than 8 weeks, so that the long-term persistence of beneficial effects was hard to determine [5]. The few trials including a longer follow-up showed that the benefits induced by physical therapy tended to vanish after the rehabilitation was stopped [3], even if some improvements induced by sensory-enhanced physiotherapy seemed to persist 3 months after the rehabilitation phase [4].

In normal subjects, physical activity ameliorates mood, which in turn may improve motor performance [2]. In line with previous studies [4, 15], we found that physiotherapy ameliorated mood in PD patients, even if this benefit tended to vanish after the rehabilitation phase.

We suggest that long periods of physical therapy are advisable to obtain a sustained improvement of PD symptoms. Periods of no treatment may be alternated because of the good follow-up effect observed in our study, but the natural progression of disability in PD may require a quite constant application of rehabilitation procedures in these patients. An eclectic combination of physiotherapeutic methods is advisable in PD; however, more work needs to be performed to determine the best combination of techniques.

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