



Comparison of two physical therapy programs in patients with Parkinson's disease

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ABSTRACT

Aim: To study the effect of two physical therapy programs in patients with Parkinson's disease.

Material and Methods: 20 elderly patients with Parkinson's disease divided in two groups participated in 25 exercise sessions. Group A performed exercises in open kinetic chain. Group B performed exercises in closed kinetic chain.

Results: Stage of the disease, motor ability, activities of daily living, cadence for 10 meters, and postural stability have been studied before and after therapeutic exercise course. In the patients of both groups a significant improvement was observed. In group A better results were shown in daily activities and motor ability, Group B improved more significantly static balance and gait.

Conclusion: Both PT methods ensured beneficial effect in all patients.

KEYWORDS : physical therapy, Parkinson's disease, elderly

Introduction

Parkinson's disease (PD) is a progressive neuro-degenerative disease, which affects mainly people above 60 years, but also occurs in younger. There is no definitive treatment of the disease yet, and its progressive nature often results in severe functional deficit with psychological, social and health issues. The most serious problem is connected with self-servicing, nutrition and independent movement of patients¹. In the complex treatment of PD, physical therapy (PT) helps to delay the occurrence of functional deficits by maintaining the basic motor functions¹. Balance and coordination exercises should be applied regularly because good postural stability and balance reduce the risk of falls and fractures^{2,3}. Exercises for adjustment of proper posture and gait with adjustment of the length of pace and rate of walking, exercises to avoid crossing of feet, involvement of hands in walking, exercises for transferring weight when standing up and seating are recommended⁴. Music and verbal control are preferred⁵. Various techniques are applied in the physical therapy sessions to reduce rigidity and increase overall mobility - stretching from various starting positions, flexibility exercises, exercises to increase axial rotation of the trunk^{6,7}. Experiments have been made with exercises against resistance, with devices, with Thera-Band, hydrotherapy^{8,9}. Some authors believe that some aerobic exercises such as walking, swimming, tourism, cycling are favorable, but patients are not always able to perform them¹⁰. Isometric exercises must also be considered in the rehabilitation of PD patients. High resistance exercises are also recommended assuming that the subsequent phase of local fatigue may result in reducing fatigue and improving the movement of patients, but there are still no conclusive evidences to such effect^{11,12}. Sport games such as volleyball, basketball and throwing and catching a ball are also recommended¹². In PT sessions is appropriate to apply art therapy¹⁴, breathing exercises and singing¹⁵, proprioceptive neuromuscular fac-

ilitation, yoga and thai-chi^{15,16}.

Searching for new and more effective tools in the rehabilitation of PD patients, attention is paid to the open and closed kinetic chain exercises. It is believed that open kinetic chain (OKC) exercises may develop speed and acceleration, while closed kinetic chain (CKC) exercises generate power¹⁶. Studies on the effect of application of CKC exercises are insufficient¹⁷⁻¹⁹.

Material and Methods

20 patients with PD, Hoehn and Yahr, stage 2.5 – 3, randomly divided into two groups were included. Group A included 4 men and 6 women, average age of 79 years. Group B included 2 men and 8 women, average age of 85 years. All the patients are on standard medical therapy. Duration of disease is from 3-10 years.

Subjects were collected in 2014, voluntarily attended. They all live in a social home for elderly people in Sofia, Bulgaria. They were able to understand instructions, perform commands without decompensated diabetes, recent stroke, myocardial infarction or fractures. Prior to therapy, all subjects had been given verbal explanations and had signed informed consent statement approved by the local Ethical Committee.

Before starting and completing the PT the following tests were studied: Unified Parkinson's disease rating scale – part II and part III; Cadence per 10 meters walking; Single Leg Stance (SLS).

The warm-up and cool-down parts of the applied PT in both groups were identical, but the main part was different in the two groups. In Group A we applied OKC exercises, while in the Group B – closed

ones. In the warm-up were applied respiratory exercises, exercises to increase flexibility and mobility, walking, coordination and relaxation exercises. In the main part, the Group A performed active exercises in OKC for the limbs and trunk, equilibrium and coordination exercises. Group B performed exercises for the limbs in a CKC – folding and unfolding at the elbow joints from a standing support position on gymnastic wall, various types of bending and squat, walking with crouching, springing etc. The cool-down in both groups included breathing and relaxation exercises sitting on a chair. The duration of PT sessions was between 30 and 40 minutes depending on the patients' condition.

All analyses were completed with a statistical software package (SPSS, version 14.0; SPSS Inc; Chicago, IL). A p value of <0.05 was considered to be significant. Descriptive data for continuous variables are presented as mean SD and percentages are presented for categorical variables. T-tests were used to compare changes between the baseline and subsequent measurements for each group.

Results

The first measurement did not show any statistically significant differences between two groups. It means that any further differences between the groups considering the equal starting level would be most likely determined by the applied PT programs.

On fig. 1. are presented the results for the UPDRS - part II -Activities of daily life.

This subscale includes 13 test activities assessed from 0 to 4 points. The total score is obtained through the sum of all test scores, meaning that the limits from the normal health status scored with 0 may reach its maximum of 52 points for daily activity and up to 68 points /17 test activities/for the indicator "Total Scale of Motor Activity", which indicates the maximum impaired status. The results show that both PT methods cause significant improvement in the studied indicators. It is higher in Group A. The difference between groups in the end of the experiment is also reliable. Specific improvement occurs mostly in the trend to reduce the time of repositioning in bed, dressing.

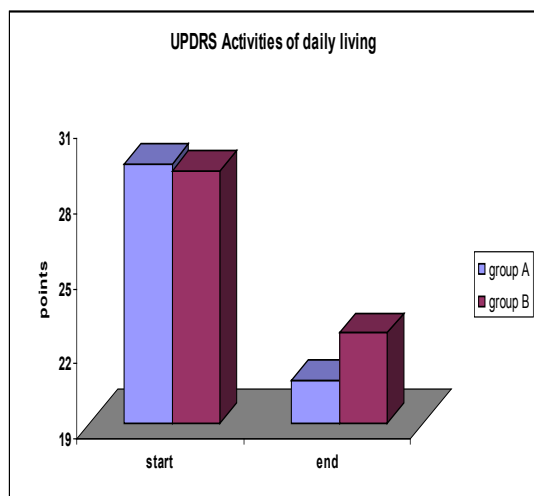


Fig.1. Changes in the mean values of UPDRS – part II – Activities of daily living (points) before and after physical therapy

The results for the UPDRS - part III - Motor function change in a similar manner (fig. 2). In both groups significant improvement is noted, particularly well demonstrated in the indicators rigidity, standing from a chair, posture stability and walking. The improvement is better in group A. It can be associated with the predominant OKC exercises, which influence the speed and coordination of movements. The improved run-in response and performance of test movements is impressive.

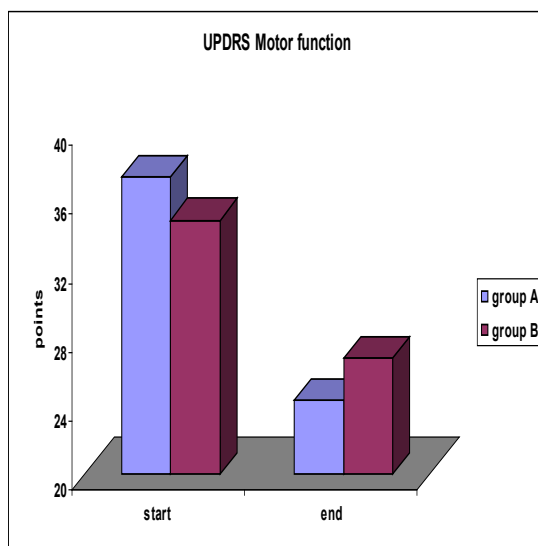


Fig. 2. Changes in the mean values of UPDRS – part III - Motor function (points) before and after physical therapy

Improvement in the static equilibrium is better in Group B. The time in balancing on one leg is almost the same as in the beginning of the study, but at the end it increases to 3,5 and 5,8 sec. In both groups the differences are statistically significant. The improved results in Group B are likely due to the special CKC exercises with retreating muscle contraction. They caused some increase in the power of lower limbs, which is also the reason for a better stability in standing on one leg.

Walking is very important for the self-servicing of PD patients. The test "Cadence per 10 meters" establishes lack of reliable differences between both groups in the initial study. The average values are approximately 20 steps per 10 m, which shows reduction of the length of steps as a result of the disease. The cadence decreases respectively by 2,88 and 5,56 steps. The changes are statistically significant. The differences between both groups are due to an increased improvement in patients who have performed CKC exercises. Probably, the targeted workout of mainly the lower limbs in the retreating muscle contraction (plyometric method) improves the overall functional status of lower limbs and results respectively in increase of the individual step.

Discussion

Given the inadequacy of studies on the topic here in the existing discrepancies in the literature, and also due to the relatively small number of cases, we interpreted the results as pilot results. However, it should be noted that CKC exercises improve the functional status of patients both after an individual session, and after the workout period. Similar results are reported by Beynnon B et al., (1997) ²⁰. Considering the limited experience in this regard, we would assume with some reserves that the CKC exercises where more than one muscle is engaged during work produce better response in the extrapyramidal share of the central nervous system. Given the fact that the extrapyramidal nervous structures and pathways control the coordination and fine movements, we may admit that this type of exercises influence well the available rigidity and coordination, which is further confirmed by the emerging changes. The intimate mechanisms, however, are difficult to explain at this stage.

Conclusion

Both PT programs have beneficial effect in patients with PD. CKC exercises are well tolerated by the patients and causes favorable impact on static balance and walking. The OKC exercises improved daily activity, motor activity and gait. OKC exercises improve agility more distinctively. CKC exercises improve postural stability and gait.

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