mgr Karolina Pamela Krzysztoń

Ocena zaburzeń równowagi w chorobie Parkinsona za pomocą prostych narzędzi diagnostycznych.

Evaluation of balance disorders in Parkinson's Disease using simple, diagnostic tools

Rozprawa doktorska

Promotor: prof. dr hab. n. med. Jan Kochanowski

SŁOWA KLUCZOWE

Choroba Parkinsona, zaburzenia równowagi, ocena funkcjonalna, posturografia

KEYWORDS

Parkinson's Disease, balance disorders, functional assessment, posturography

Streszczenie w języku angielskim

Evaluation of balance disorders in Parkinson's Disease using simple, diagnostic tools

Summary

Introduction

Balance and gait disturbances may appear early in Parkinson's disease (PD) and progress dynamically. Balance control is essential for mobility, and its disturbance has a negative impact on patients' quality of life. The consequence of the occurrence of this type of disorder is most often a significant reduction in physical activity and falls. The associated trauma, significant mobility restrictions and the risk of complete immobility are extremely dangerous and life-threatening for people with Parkinson's disease. Balance assessment tools that distinguish the types and causes of balance problems can help guide the type of intervention to more effectively treat the disorder. Highly specialized medical equipment is also used for a detailed assessment of the balance, which is associated with limitations in its availability.

The aim of the study

The aim of the study was to develop the most useful set of tests for quick and reliable assessment of balance in people with Parkinson's disease. Selected tests should be possible to perform by a physiotherapist or a doctor in a short time (e.g. during the first visit), without the need to use highly specialized measuring equipment.

Material and methods

The study group included 37 people with Parkinson's disease (according to UK Parkinson's Disease Society Brain Bank criteria) – 19 women and 18 men aged 42-90 years. The disease duration of the subjects ranged from 1 to 10 years, and the degree of disease advancement according to the H&Y scale was 1 to 3.

The control group consisted of healthy people, i.e. without a history of balance disorders and extrapyramidal diseases, selected according to age (± 2 years), sex and level of physical activity exactly to specific people from the study group (in the 1:1 ratio).

People with Parkinson's disease were assessed after they had taken a sufficiently early dose of dopaminergic drugs (the 'on' phase).

The first stage of the study was a review of the literature available since 2008 on the assessment of balances disorders in Parkinson's disease. On this basis, functional tests were selected.

The Balance Evaluation Systems Test (BESTest) is reliable and valid, but time-consuming. A shorter version of BESTest, based on the Brief-BESTest, has been proposed with additional tests that are sensitive to common balance problems in Parkinson's disease (e.g. retropulsion and two-tasking performance).

The Brief-BESTest was selected for the study because this kit allows the screening of various aspects of postural control while having good sensitivity and specificity. Moreover, the tests included in it are quite difficult, what may allow for the detection of possible balances problems in the early stages of the

disease. Additional criteria for selecting tests were equipment, time and ease of administration – this kit does not require too many utensils (a chair, sponge and ruler are enough) or expensive training, so it can be performed on an outpatient basis in just a few minutes. All participants were tested using a set of selected tests consisting of 13 evaluation measures: biomechanical limitations (1), stability limits (2), standing on one leg – right and left side (3R/3L), compensatory use of a four-way step strategy (4R/4L/4A/4P), sensory orientation (5) and stability in gait (4 versions of the Timed Up & Go test – standard, with an additional cognitive task, with an additional motor task and fast).

In order to objectify the results and evaluate the proposed set, measurements were also carried out using the posturographic platform. The study included:

1) standing and holding position with eyes open/closed (EO/EC)

2) reaching forward (FR)

3) standing on one leg (both sides, right and left respectively – SOLR and SOLL)

4) dual-task (EO DUAL)

5) standing and maintaining position with eyes open/closed on unstable surface (EO Airex/EC Airex).

The measurements were performed using the TechnoBody "Stability" ST-310 posturographic platform, with the Postural Suite software. Each of them lasted 30 seconds.

The main statistical analyzes were carried out in related groups – a couple was a person diagnosed with idiopathic Parkinson's disease and a healthy person, matched in terms of age, sex and declared level of physical activity. The comparative analysis of the results between the groups was carried out with- and without an additional division into age groups.

37 pairs were analyzed – 19 pairs of women and 18 pairs of men. The level of significance was 0.05.

Results

There were statistically significant differences in the total results of functional tests between the group of people with Parkinson's disease and the control group (median 66.67% PD vs 91.67% in the control group). The results of most functional tests differed statistically significantly between the groups – people with PD usually obtained fewer points. The analysis showed that the results of some tests may depend on the age of the participants. However, regardless of age, statistically significant differences between people with PD and the control group were shown in the summary results of the Brief-BEST PLUS.

In the case of Brief-BESTest, both the maximum (24 points) and the minimum (0 points) possible score was not achieved by any person from the study group. Similarly, in Brief-BESTest PLUS, none of the people with PD received neither the maximum (33 points) nor the minimum possible result (0 points). Hence, no ceiling and threshold effects were found in the proposed sets.

The values of parameters such as perimeter, ellipse area and average COP velocity differed statistically significantly between the groups in many tests on the posturographic platform. Increased sway values indicate abnormalities in the postural control of people with PD compared to healthy people.

It was shown that groups of people that differed in the number of points scored in individual functional tests also significantly differed in the values of many parameters characterizing the results of similar tests carried out on the posturographic platform.

Conclusions

1. The proposed, proprietary selection and extension of the set of tests enables a quick and comprehensive assessment of balance disorders in people with Parkinson's disease in the absence of access to posturographic examination in hospital and outpatient conditions.

2. Both the results of functional tests and posturographic examination confirmed the occurrence of greater balance disorders in people with Parkinson's disease.

3. Postural control disorders occur in the early stages of Parkinson's disease in people without clinical evidence of balance disorders.

4. The applied set of tests allows for the detection of balances problems characteristic of Parkinson's disease, regardless of the age of the patients.