IOSR Journal of Nursing and Health Science (IOSR-JNHS)
e- ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 7, Issue 3 Ver. IX (May-June .2018), PP 43-47
www.iosrjournals.org

Balance Assessment In Patients With Parkinson's Disease

Moataz M. El Semary[1], Ayman A. Nassif [1], Islam M. Al-Azab[1], Mohamed Al Awaady[2], And Maha M. Mokhtar [3]

[1]*Department for Neuromuscular Disorder and its Surgery, Faculty of Physical Therapy,Cairo University, Egypt.*
[2]*NEUROLOGY, Cairo University, Egypt.*
[3]*Ahmed Maher teaching hospital, Egypt.*
Corresponding Author: Moataz M. El Semary

Abstract:*The aim of this examination was to assess the postural adjust in individuals with Parkinson's disease by using clinical and instrumental techniques and specify the most direction in the balance instability in the Parkinson's patient. Methods: Twenty male patients, ages ranged from 55 to 75 years, stage II & III according to modified Hoehn and Yahr (1997) classification of disabilities and ten male healthy elderly subjects, ages ranged from 55 to 75 years, participated in this study. All subjects were recruited for postural balance assessment and done by using; Berg Balance Scale (BBS) &Timed Up and Go test (TUG) as clinical tools in measuring the postural balance as well as the instrumental assessment by using the Biodex Stability System (BSS) to determine the correlation between those methods. The results showed significant differences in detecting balance instability by using BBS and BSS, while there was no significant difference between both groups by using TUG test. BSS determine the direction of tilt of patients. It was found that the mediolateral direction revealed more balance instability than the anteroposterior direction. Conclusion: Biodex Stability System is an effective screening tool for identifying the fallers from the non-fallers in Parkinson's patients. It enables the identification of the most direction of tilt of Parkinson's patients.*

Keywords:*Biodex Stability System– Berg Balance Scale – Timed Up and Go test –Parkinson's patients.*

Date of Submission: 13-06-2018 Date of acceptance: 28-06-2018

I. Introduction

Parkinson's disease (PD) is a chronic neurodegenerativeprogressive movement disorder defined by the existence of bradykinesia, tremor, and rigidity [1].Postural instability during dynamic transitional movements such as rising from a chair is the cause of increased risk of falls. Falls are a characteristic feature of the disease progression leading to considerable morbidity and mortality. Transfers are so problematical in PD; leg weakness, particularly at the hip, explains a part of the difficulties experienced by PD patients' while attempting to rise from a chair. So, in PD the efficacy of strength training to improve transfers remains to be demonstrated for PD patients. Alternative strategies to improve transfers are available, including the chaining technique splitting complex movements up into a series of simple components that are to be executed sequentially [2].Two dynamic transitional movements, which challenge the postural stability of PD patients, are gait initiation (gi) and the sit-to-stand task (STS). Gait initiation is defined as an elegant sequence of postural shifts that culminates in a forward step. Gait initiation is challenging to the motor system since it is just a volitional transition from a static steady support to a continuously unsteady posture during locomotion. Thus many researchers have used gait initiation as an evaluation of dynamic postural instability [3].Deficiency in virtually any one of the multiple motoror sensory mechanisms of the postural system can produce dynamic effects on postural steadiness and motor performance. Numerous factors including physiological functions, biometric factors, cognitive control, visual feedback and cerebellar activity have shown to impact postural sway. As a result, numerous disorders including personal injury, aging or neurological and orthopedic pathologies can adversely have an impact on postural sway by modifying the ability of the body control system to adjust to changing stimuli; thus increasing both sway and the energy expenditure necessary to maintain the erect upright stance. The interruption of balance can result in a feeling of instability, vulnerability, as well as predispose falls and further harm [4].

The goal of this research was to examine the postural balance performance in PD patients and determine the difference in the guidelines regarding the directions of tilt of Biodex Stability System which may assist in the treatment program of Parkinson's patients.

II. Material And Methods

This cross sectional case control study was carried out on the outpatient clinic of AlkasrAleini hospital, Cairo University, Egypt. And also in outpatient clinic of faculty of physical therapy, Cairo university, Egypt.From May 2017 to February 2018.

Study Design: Cross sectional case control study

Study Location: This study was carried out on the outpatient clinic of AlkasrAleini hospital, Cairo University, Egypt. And also in outpatient clinic of faculty of physical therapy, Cairo university, Egypt

Study Duration: May 2017 to February 2018.

Sample size: 20 patients and 10 healthy aged matched.

Sample size calculation: The sample size, considering confidence level of 95% and power of 80%, also we used similar studies to calculate sample size.

Subjects & selection method: The study population was recruited as being a Parkinson's patients recruited from AlkasrAleini hospital outpatient clinic, Cairo University Egypt, and also outpatient clinic of faculty of physical therapy, Cairo University, Egypt from May 2017 to February 2018.

Inclusion criteria:

1. Parkinson's patients, stage II & III according to modified Hoehn and Yahr (1997) classification of disabilities.
2. Male sex.
3. Ages ranged from 55 to 75 years.
4. The patients were diagnosed by a neurologist as having Parkinson's disease based on careful clinical assessment and radiological investigations including magnetic resonance imaging (MRI) of the brain.
5. Patients diagnosed and had Parkinson's disease since 5 years.

Exclusion criteria:

1. Female sex.
2. Parkinson's patients, stage IV & V according to modified Hoehn and Yahr (1997) classification of disabilities.
3. Patients diagnosed and had Parkinson's disease less than 5 years.
4. Patients aged less than 55 years.
5. Patients with other neurological disorders except for Parkinson's disease.
6. Patients who are deaf or blind.
7. Patients who aren't alert enough to complete the assessment.

Procedure Methodology

Following each subject or their relatives reads and signs an informed consent, then, the patients were assessed by an experienced PT; demographic data were obtained including age, sex. Twenty male Parkinson's patients form the study group. Evaluation environment was constant through the study. The analysis procedures were done to each patient by the same physiotherapist, a brief explanation about the protocol of evaluation was given to each patient.

Instrumentation

The data were collected through the use of: 1) Biodex Stability System (BSS) for balance assessment (Biodex medical system. Inc. brook baren R&D plaza 20 Ramsay roads. Box 702, Shirly., New York 11967-0702) [5].

Procedures

All patients were informed with the apparatus components and steps of analysis and participated in several trials with the equipment to assure them psychologically and to be familiar with the study. The study was conducted at Biodex Stability System Lab.., faculty of physical therapy, Cairo University.

All patients were subjected to the following assessment:

- Timed Up and Go (TUG) test:

Task: By the command "Go", the subject stood from a standard chair, walked three meters, turned and walked back to the chair. Timing started when the command was given and ended when the subject sat again on the chair. The Timed Up and Go test and comfortable gait speed are highly correlated with locomotion abilities and autonomy in the elderly [6].

- Berg Balance Scale:

The subjects were asked to apply the 14 items after instructing them by verbal commands and showing them each item by the therapist. The average time to complete the test is between 15 -20 minutes. Each item was scored individually the sum of all items were added together to show the total score of each subject.

- Fall history score:
A subject was asked about the number of falls. The scores ranged from 1 (none) to 3 depending on the number of falls.

Assessment of balance using Biodex Stability System) in Biodex Stability System Lab. included:
i) Tests were done for subjects of both groups on Biodex Stability System at stability level 8for 20 secs. [7].
ii) Each subject was received the verbal explanation about the test steps, and then asked to center him on the foot platform before starting the test, while the foot platform deflection was limited to less than 5 degrees.
iii) The subject was instructed to achieve a centered position on the platform when it was released by shifting position on feet until subject find that it is the best position for his feet to keep the cursor centered on screen grid.
iv) The subject was tested without footwear and was asked to perform two tests trials before the specific test was conducted for the purpose of instrument familiarity prior to data collection [8].
v) Subjects performed the test with eyes opened. At the end of each test, a printout report will be obtained. This report will be included information as regard AP, ML and overall level of stability.

Statistical analysis
Data were analyzed using IBM SPSS Advanced Statistics version 22.0 (SPSS Inc., Chicago, IL). All assessment variables were tested for normality of distribution (Shapiro-Wilk test). Unpaired t-test was used to compare the mean changes in the subject's parameters in between the two groups [9].

III. Result

The two groups were comparable regarding age, weight, height, and body mass index (BMI) as appeared in table no 1. On the other hand table no 2 indicates mean values of TUG, BBS, and FHS for both groups: There was a highly statistically significant increase of TUG test (sec) (P=0.0005). There was a statistically significant decrease of BBS test (P=0.0018). There was a statistically significant increase of FHS (P=0.0085).Table 3 shows statistically significant differences between patient and control group as regards the three limit of stability mediolateral, anteroposterior and overall with p-value (0.001, 0.005, and 0.002) respectively.

Table no 1: Demographic and clinical characteristics of the two studied groups.

m	**Group I n=20**	**Group II n=10**	**p- value**
Age (years)	65.45±4.85	63.6±5.08	0.341
Height (cm)	170.55±10.12	170.9±7.84	0.925
Weight (kg)	78±17.69	80.67±13.16	0.678
Body mass index (kg/m^2)	26.97±4.16	28.80±6.81	0.261

Table no 2: Mean values of TUG, RSTS, and FHS for both groups.

	Group I n=20	**Group II n=10**	**p- value**
TUG	16.15±3.98	11±1.25	0.0005**
BBS	44.5±6.6	49.8±4.3	0.0018*
FHS	2±0.56	1.4±0.52	0.0085*

Table no 3: Biodex Stability system (limit of stability).

	Group I n=20	**Group II n=10**	**p -value**
Mediolateral (ML)	1.83±0.49	1.40±0.39	0.001*
Anteroposterior (AP)	2.16±0.98	1.58±0.68	0.005*
Overall (OA)	2.75±1.06	2.00±0.75	0.002*

IV. Discussion

This controlled randomized study was conducted to evaluate postural balance performance in PD patients, determine the difference in the directions of tilt of Biodex Stability System which may help in the rehabilitation program of Parkinson's patients, and compare the dynamic stability of the PD patients to healthy aged -matched subjects. This study was conducted to evaluate clinical functional skills of the lower limbs in Parkinson's patients. The subjects were assessed clinically using timed up and go test, the Berg Balance Scale and fall history, and Biodex Stability System (Limit of Stability).

The intro of time and distance way of measurement has improved the product quality and objectivity of clinical measures for human being function in the treatment setting. Including the 6 min walking test8 and the modified 10 m test [10].

The time between going out of the chair and the establishment of the gait pattern is especially difficult, involving an instant change instability and change in movements' direction which, vulnerable subjects may need to execute carefully preventing large momenta which might be difficult to regulate or threaten their steadiness. This may describe the large drop in forwarding velocity in the elderly people vulnerable to falls after seat-off. This hesitancy during movements has been observed before in older populations [11].

While Parkinson's patients rose to near fully erect height and appeared to balance them before initiating gait. Vertical momentum at the time the swing foot left the ground was significantly less in PD compared to elderly ones, indicating that Parkinson's subjects had finished rising prior to starting gait initiation [12].

Time Up and Go test (TUG) is the shortest and simplest clinical balance test. It is widely used because of its easiness, with which it can be performed in the clinic [13], but it is not possible to separate which balance and gait subcomponents are affected [14].

Rabuffetti and colleagues demonstrated that it is possible that testing more related to active tasks are definitely more sensitive to falls regarding static tests. The introduction of an instrumented active test might provide objective and very sensitive data to anticipate fallers [15].

The main outcome in our study was a specific rehabilitative training resulted in a noticeable difference of postural steadiness in patients with PD. This end result was reinforced by the actual fact that the study was a randomized controlled trial completed on a significant sample of patients and this the techniques used for balance examination incorporated lots of testing that provided a thorough picture of the different areas of postural instability. Specifically, the issue of balance evaluation methods is very relevant in PD treatment studies [16, 17]. Indeed, postural instability in PD has a sophisticated pathophysiology and induces various disabling conditions such as difficulty with transfers, gait disorders, incapability to live independently at home, and falls. Upon this basis, recent studies recommend the utilization of multiple testing to improve the examination of postural instability in PD. [18].

An important final result of our research was a significant reduction in falls during daily life in the Parkinson's group. That is specifically relevant because people with PD who have experience recurrent falls and put up with fall-related accidental injuries, including fractures [19].

Fear of falling is also recurrent in community-dwelling people who have PD, producing a limitation of activities, compromising their quality of life and predisposing those to supplementary reductions in muscle power and cardiovascular fitness. Because our training had not been particular innovated to instruct ways to prevent falls, the balance abilities attained after treatment may possibly expand to untrained activities also.

The causes of the differences of the current study results' and the others may be attributed to: 1. Differences between evaluation parameters and procedures in other instrumental scales compared to the BSS scale, 2. The degree of difficulty of each scale (according to the present study, the BSS scale was used at level eight which is the most stable level) and 3. The BSS considered as a static measuring scale of balance assessment, adding a dynamic measuring instrument may be beneficial in determining the dynamic parameters in postural balance assessment.

Further proper recognition of postural imbalance and monitoring of potential worsening allows the therapist to create appropriate intervention plans which include the use or adjustment of the clinical and functional rehabilitative process.

V. Conclusion

The usage of more technically complex devices as Biodex Stability System can provide more objective, quantitative measures of postural imbalance. The mediolateral direction shows more difficult for patients in controlling their balance rather than anteroposterior direction. This may help in determining the direction of affection of balance in which help in applying the suitable rehabilitation program of Parkinson's patients.

These findings have potential implications for understanding the risk of falls in PD patients during dynamic transitional motions and provide a framework for studying the STW motor task.

Declaration of Conflicting Interests

The authors announced no potential conflicts of interest with regards to the authorship and publication of the article.

Funding

The authors received no financial support for the study and authorship of the article.

Acknowledgments

The authors acknowledge the individuals participated in this study.

References

[1]. Ueno E. Yanagisawa N. and Takami M. : Gait disorders in Parkinsonism. A study with floor reaction forces and EMG. Adv. Neurol. 2005; Oct., Vol. (60), pp.414-418.
[2]. Douglas J.C., Eugene O and Sid G: Diagnostic criteria for Parkinson's disease. Arch. Neurol. 1999; Dec., Vol. (56), pp.33-39.
[3]. Hass CJ, Gregor RJ, Waddell DE, Oliver A, Smith DW, Fleming RP, Wolf SL. The influence of Tai Chi Training on the Center of Pressure Trajectory During Gait Initiation in Older Adults. Arch Phys Med Rehabil. 2004; 85(10): 1593-1598.
[4]. Fasano A, Plotnik M, Bove F. The neurobiology of falls. Neurol Sci. 2012; 33:1215-1223.
[5]. Finn E. Stability performance assessment among subjects of disparate balance abilities. Southern Connecticut State Univ. J BMC. New Haven, USA, 1999.
[6]. Shinkai S., Watanabe, S., Kumagai, S., Fujiwara, Y., Amano, H., Yoshida, H., et al.: Walking speed as a good predictor for the onset of functional dependence in a Japanese rural community population. Age Ageing. 2000; 29, 441–446.
[7]. Aydog E, Depedibi R, Bal A, et al. Dynamic postural balance in ankylosing spondylitis patients. Rheumatol, 2006; 45(4): 445-8.
[8]. Leaphart SM, Pinciverto D& Henry T. Learning effects and Rehabilitation of Biodex Stability System. J Athetl train, 1995; 30:535.
[9]. Bluman A. Elementary statistics: A step by step approaches, 5th ed., Mc Graw Hill Higher Education. Boston, New York, London, 2004; pp.431-583.
[10]. Baer G, Smith M. The recovery of walking ability and subclassification of stroke. Physiother Res Int, 2001; 6(3):135–44.
[11]. Bloem B.R., Beckley D.J., Van Dijk J.C., Zwinderman A.H., Remler M.P. and Roos R.A. Influence of dopaminergic medication on automatic postural responses and balance impairment in Parkinson's disease. Mov. Disord, 2003; Vol. (11), pp.509-521.
[12]. Thomas A Buckley. Dynamic postural stability during the sit-to-walk transition in individuals with Parkinson's disease. Doctoral dissertation. Columbia University, 2007; pp: 50-90.
[13]. Weiss A, Herman T, Plotnik M et al.. Can an accelerometer enhance the utility of the Timed Up& Go test when evaluating patients with Parkinson's disease? Med. Eng. Phys. 2009; 32(2):119-125.
[14]. Zampieri C, SalarianA, Carlson-Kuhta P, et al.. An instrumented Timed Up and Go test characterizes Gait and postural transitions in untreated Parkinson's disease. J> Neurol. Neurosurg. Psychiatry, 2010; 81:171-6.
[15]. Rabuffetti M., Bovi G., Quadri P., et al. Postural stabilization:
what are no more movement and not yet posture? IEEE Trans Neural SystRehabilEng, 2011; 19(4), 420-426.
[16]. Visser M, Marinus J, Bloem BR, Kisjes H, van den Berg BM, van HiltenJJ.Clinical tests for the evaluation of postural instability in patients with Parkinson's disease. Arch Phys Med Rehabil.2003; 84:1669-1674.
[17]. Jacobs JV, Horak FB, Tran VK, Nutt JG. Multiple balance tests improve the assessment of postural stability in subjects with Parkinson's disease. J NeurolNeurosurg Psychiatry.2006; 77:322-326.
[18]. Hirsch MA, Toole T, Maitland CG, Rider RA. (2003). The effects of balance training and high-intensity resistance training on persons with idiopathic Parkinson's disease. Arch Phys Med Rehabil. 2003; 84:1109-1117.
[19]. Hely MA, Morris JG, Traficante R, Reid WG, O'Sullivan DJ, Williamson PM. (1999). The Sydney multicenter study of Parkinson's disease: progression and mortality at 10 years. J NeurolNeurosurg Psychiatry, 1999;; 67:300-307.

Moataz M. El Semary. "Balance Assessment In Patients With Parkinson's Disease." IOSR Journal of Nursing and Health Science (IOSR-JNHS), vol. 7, no.3, 2018, pp. 43-47.