Case Report

The Effect of Associated Parkinsonism on Rehabilitation in Stroke Patients: A Case Series

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Abstract

Stroke and Parkinson's disease are 2 major causes of movement impairment and a decreased ability to perform daily activities. The aim of this case series was to demonstrate the difficulty of rehabilitation in stroke patients with accompanying parkinsonism. Four stroke patients with parkinsonism who underwent rehabilitation at the Physical Medicine and Rehabilitation Clinic between March and May of 2016 were evaluated. The Standardized Mini-Mental State Examination (SMMSE), the Functional Independence Measure (FIM), the Barthel Index (BI), the Berg Balance Scale (BBS), and the Stroke Impact Scale version 3.0 (SIS) were used in the assessment. Of the 4 patients, 3 were female, and the mean age was 74.5±9.3 years. The mean hospital stay was 19±5.3 days. The initial test scores recorded were low, and they remained low at the time of discharge. After rehabilitation, the mean FIM score in the group was 42% of the maximum possible score, the mean SMMSE was 55%, the BI was 18%, the BBS was 0.08%, and the SIS was 25%. Three patients required a wheelchair, and 1 patient could ambulate with a walker at discharge. A stroke accompanied by parkinsonism negatively affects mobility and functional status, primarily through the deterioration of balance. In this study, cognitive function was reduced to half of the maximum, and the balance and function loss was more than 50%. Barthel index; berg balance scale; functional independence measure; mini-mental state examination; parkinsonism; stroke; stroke impact scale.

Keywords: Barthel Index, Berg Balance Scale, Functional Independence Measure, Mini-Mental State Examination, parkinsonism, stroke, Stroke Impact Scale.

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Parkinson's disease (PD) is a neurodegenerative disease that manifests with symptoms of parkinsonism, typically at around 60 years of age. The English physician, James Parkinson,[1] first defined the disease in 1817 in his monograph "An Essay on The Shaking Palsy." It is the second most frequently seen neurological disease after Alzheimer's disease. The prevalence and incidence of Parkinson's disease has been reported as 360/100.000 and 18/100.000, and it constitutes more than 80% of all cases with parkinsonism.[2, 3, 4, 5]

Posture and gait disturbances cause increasing disability in this disease, and as balance, transfer skills, and walking ability decrease, physical activity and quality of life also regress, which makes rehabilitation more difficult.[3, 6, 7, 8]

The main symptoms of PD consist of bradykinesia, resting tremor, rigidity, and postural instability. Though the walking pattern changes according to the disease stage, a shorter stride length and a decrease in the number of steps per minute can be seen. In advanced stages, difficulty in

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starting to walk, motor blocks, and postural imbalance may be observed.[2, 9] The severity of PD is evaluated in 5 stages according to the Modified Hoehn and Yahr Scale:[10]

Stage 1: Unilateral tremor, rigidity, akinesia, or postural imbalance. The patient is mildly symptomatic.

Stage 1.5: Unilateral and axial involvement

Stage 2: Bilateral tremor, rigidity, akinesia or bradymimia, difficulty swallowing, dysphagia with or without postural abnormalities, axial rigidity (especially involving the neck), forward leaning posture, shuffling walk, and general rigidity. Minimal disability may be seen.

Stage 2.5: Moderate bilateral disease with recovery on pull test

Stage 3: Balance impairment is seen in addition to the findings detected in Stage 2. The patient can perform daily activities independently; however, a moderate degree of dysfunction is present.

Stage 4: The patient needs help in some or all of his/her daily activities. Severe disability is present, but the patient is able to walk or stand unassisted.

Stage 5: The patient requires a wheelchair or is bedridden.

The Unified Parkinson's Disease Rating Scale (UPDRS) is one of the standard scales used in the evaluation of PD. Since the disease has many dimensions, the UPDRS evaluates 4 clinical areas (total: 183 points): motor skills (total: 92 points), daily activities (total: 52 points), mentation, behavior, and mood (total: 16 points), and complications of therapy (total: 23 points).[11]

Though the complete etiology of PD is not precisely known, oxidative stress is thought to cause degeneration of dopamine-producing neurons.[12-15] Oxidative stress plays a role in the pathogenesis of endothelial dysfunction and atherosclerosis.[12, 16, 17] A meta-analysis demonstrated that orthostatic hypertension, which is seen in nearly 30% of cases of PD, is a risk factor for stroke.[12, 18] Furthermore, in recent studies, a greater incidence of essential hypertension and diabetes has been observed in patients with PD. In addition to vascular pathologies, essential hypertension and metabolic etiologies, such as diabetes and dyslipidemia, have been thought to be potential risk factors for the development of PD.[12, 19-23]

Some studies conducted with control groups have detected a greater incidence of stroke in patients with PD, while in others, the incidence of stroke in these patients was comparable or even lower than that observed in the control group.[24-29] In studies where a lower incidence rate was observed, suppressing the dopaminergic effect in patients with PD has been thought to have a protective effect against stroke.[24, 30-32]

An overlap between PD and cerebrovascular disease (CVD) can lead to complex motor damage. Sometimes it is difficult to discriminate between the clinical manifestations of these 2 entities. CVD plays a role in the progression and the phenotype of PD. The vascular pathology involved leads to capillary fragmentation and subsequent impairment of the capillary network in various regions of the brain. This damage, known as leukoaraiosis, involves the substantia nigra, the midfrontal cortex, and the basal nuclei of the brain. All of these limit the effect of antiparkinson treatment on motor and cognitive skills. In a literature review, in 8 of 11 studies, a correlation was detected between impairment of cognition and leukoaraiosis. In another study of 62 patients it was determined that widespread leukoaraiosis observed in magnetic resonance imaging affected the total and motor skills scores on the UPDRS.[33-36]

Pharmacological treatment is the first choice in the management of PD. However, despite optimal treatment, balance problems typically persist. Exercise regimens specifically designed for PD should be created to prevent progressive deterioration in balance and other negative effects of PD on the quality of life of the patients.[6, 37]

The aim of this case series was to explain and demonstrate some of the difficulties encountered during the rehabilitation process with stroke patients because of associated PD using clinical scales.

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The association between stroke and parkinsonism was reviewed in 4 stroke patients (3 women and 1 man) hospitalized between March and May 2016 in the Physical Medicine and Rehabilitation Clinic. Case 3 was evaluated as idiopathic PD, while the other 3 were thought to perhaps be vascular PD, based on the lack of a previous diagnosis of idiopathic PD and the temporal association with stroke .

The effectiveness of rehabilitation therapy was evaluated using the Standardized Mini-Mental State Examination (SMMSE), the Functional Independence Measure (FIM), the Barthel Index (BI), the Berg Balance Scale (BBS), and the Stroke Impact Scale version 3.0 (SIS) at admission and discharge.

Standardized Mini-Mental State Examination

This brief screening test developed by Folstein et al. in 1975 is the most frequently used screening test for dementia. It consists of 11 questions completed within 10 minutes, and the test is evaluated based on a total score of 30 points. A score of 24 to 30 points is assessed as normal, 18 to 23 points is considered mild dementia, and ≤17 points is seen

as indicative of severe dementia.[2] In a validation study performed in Turkey, the threshold value for mild dementia was reported as 23/24.[38] The test examines the areas of orientation (10 points), immediate recall (3 points), attention and calculation (5 points), memory (3 points), and language (9 points). In some publications, the scoring is evaluated as follows: 27 to 30 points is within the normal limits, 24 to 27 points reflects mild cognitive impairment, and ≤24 points suggests severe cognitive damage.[39]

Berg Balance Scale

The BBS assesses an individual's ability to maintain their balance while performing functional activities that become increasingly more challenging for balance. Zero indicates the lowest level of function and 4 the highest level of function. The total score ranges from 0 to 56. The score achieved is evaluated as follows: 0 to 20 points signifies that the patient is at great risk of a fall, 21 to 40 points suggests a moderate risk of a fall, and 41 to 56 points indicates a low risk of a fall.[40, 41] Şahin et al.[42] performed a reliability and validity study of a Turkish version in 2008, and in 2013, it was also found to be appropriate, reliable, and valid for use with stroke patients.[43]

Functional Independence Measurement

The FIM is comprised of 18 items, grouped into 2 subscales: motor and cognition. The subscales includes assessment of performing personal care, eating, bladder and bowel management, locomotor skills, comprehension, communication, social interaction, memory and problem solving. Each item is evaluated using a 7-point scale, with a total possible score of 126 points. Yavuzer et al. [44] published a reliability and validity study of the scale in Turkish in 2001.

Barthel Index

The aim of this test is to record current performance of daily activities, rather than potential. The patient is scored according to whether or not these activities can be accomplished independently or not, and the score demonstrates the degree of dependency on assistance. A lower score indicates greater independence in performing basic daily life activities.[45]

Stroke Impact Scale 3.0

The SIS is used to evaluate the perception of quality of life following a stroke, and is completed either by the patient or a caregiver. It consists of 8 subdimensions and 59 questions. Each question rates the impairment experienced by the patient in the previous week using a 5-point Likert scale. Each section has a maximum score of 100 points. The SIS also assesses the perception of recovery after a stroke on a 100-point visual analogue scale (0: no improvement, 100: full recovery) in addition to the 8 subdimensions measuring current experience.[46-49]

Results

The study population consisted of 3 female patients and 1 male patient, with a mean age of 74.5±9.3 years (range: 66-84 years), and a mean hospitalization period of 19±5.3 days (range: 14-25 days). The diagnosis of parkinsonism was made between 3 months and 8 years before the onset of stroke (median: 35 months). The mean score at admission was SMMSE: 16.8±4.5 points (range: 10-21 points), FIM: 51±18.5 points (range: 40-70 points), BI: 18.75±12.5 points (range: 10-35 points), BBS: 4.5±2.8 points (range: 0-7 points), and SIS: 19.8±3.2 points (range: 17-22 points). The mean score at discharge was SMMSE: 17±5.2 points (range: 10-22 points), FIM: 53±19.2 points (range: 42-73 points), BI: 20±10.8 points (range: 5-35 points), BBS: 4.5±2.8 points (range: 1-8 points), and SIS: 20.3±5.6 points (range: 7-24 points) (Tables 1 and 2).

The scores obtained were low both at admission and dis-

Table 1. Demographic characteristics of the patients						
Patient	Age/Gender	Indication for Hospitalization	Location of the Lesion	Additional Diseases	History of Parkinson's Disease	Treatment of Parkinson's Disease
1	67/F	Ischemic CVE	Right capsula interna	HT, DM, Hypothyroidism	2 years	Untreated
2	84/F	Ischemic CVE	Right thalamus	Alzheimer's, HT, DM	3 months	Levodopa+Benserazide
3	81/M	Ischemic CVE	Right lentiform nucleus	BPH	8 years	Levodopa+Carbidopa+ Entacapone
4	66/F	Ischemic CVE (4. episodes)	Left temporal lobe	HT, DM	1 year	Levodopa+ Benserazide

BPH: Benign prostatic hyperplasia; CVE: Cerebrovascular event; DM: Diabetes mellitus; HT: Essential hypertension.

Table 2. Evaluation of the patients during hospitalization and at discharge*

Patient	Brunnstrom staging (6/6/6)	SMMSE (30)**	FIM (126)**	BBS (56)**	BI (100)**	SIS VERSION 3.0	Duration of Hospitalization (days)
1	6/6/5	21	63	7	35	23	14
	6/6/6	22	65	8	35	24	
2	4/4/5	10	31	3	5	17	22
	5/5/5	10	32	4	10	17	
3	4/4/5	16	70	4	20	17	25
	5/5/5	16	73	5	20	18	
4	2/3/3	20	40	0	15	22	15
	3/4/3	20	42	1	15	22	

Brunnstrom staging: Upper extremity/hand/lower extremity; BBS: Berg Balance Scale; BI: Barthel Index; FIM: Functional Independence Measurement; SIS: Stroke Impact Scale; SMMSE: Standardized Mini-Mental State Examination; *The first row displays the initial scores and the second row represents the scores recorded at discharge; ** Values within parentheses are the maximum possible scores.

charge. At discharge, the mean FIM and SMMSE values were 42% and 55%, respectively, of the maximum possible score, while the mean BI, BBS, and SIS scores were 18%, 0.08%, and 25%, respectively, of the highest possible score.

Since these patients had parkinsonism as well as a stroke, and were therefore not isolated cases of PD, the Hoehn-Yahr scale and the UPDRS could not be applied.

Discussion

The aim of this research was to demonstrate that parkinsonism accompanied by stroke presents difficulties for the rehabilitation process. The clinical scales of SMMSE, FIM, BI, BBS, and SIS were used to illustrate patient progress.

The SMMSE, administered to assess the cognitive state of the patients revealed 2 cases of mild disorder and 2 cases of severe cognitive impairment. In this patient group, the average cognitive function score was approximately half the normal value. Investigation suggested that Alzheimer's disease may have contributed to a low score in Case 2, and vascular disorders in the other patients may have reduced the SMMSE scores. Assessments performed at discharge did not differ significantly from the admission scores. Our review of the literature indicated that the SMMSE is an appropriate and adequate scale for the measurement of cognitive function in cases of parkinsonism.[50] In 2014, Özdilek and Kenangil[51] demonstrated that the Turkish version of the Montreal Cognitive Assessment Scale may also be used.

The BSS has frequently been used in the literature to evaluate balance skills of patients with PD, and these patients are often found to be in the high-risk group.[39, 52] All of the study patients were evaluated as being at high risk of a fall at admission and at discharge.

Performance of daily living activities was rated using the BI and the FIM. Our results indicated that the patients were moderately to highly dependent on a caregiver.

One of the limitations of this study is that 3 of our patients required the assistance of a caregiver before the cerebrovascular event (CVE). In addition, 1 patient had recurrent CVE episodes, which could complicate the rehabilitation process in addition to Parkinson's disease.

Based on these evaluations, adequate clinical improvement was not achieved during the hospitalization period of our patients. At discharge, 3 patients required a wheelchair, and 1 patient could walk with the aid of a walker. Certainly, in addition to Parkinson's disease, age, previous functional dependencies, and the location and size of the lesion can all affect the rehabilitation process. In order to clearly evaluate the impact of Parkinson's disease, long-term studies are needed to evaluate and compare patients with only CVE.

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