

Multidisciplinary approach to the rehabilitation of a patient with parkinsonism – a case report

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ABSTRACT:

A 71-year-old patient was referred for rehabilitation in an advanced stage of parkinsonism. The patient presented with a slow gait, postural instability, bradykinesia, slightly increased upper limb tone, discrete tremor of the right hand, hypomimia and hypophonia. The multidisciplinary rehabilitation team consisted of a physiatrist, a neurologist, an otorhinolaryngologist, a speech-language pathologist, an occupational therapist, a physiotherapist and a medical technician. An individualized rehabilitation plan included multimodal physiotherapy, occupational therapy and speech therapy. Standardized tests were used to evaluate the effects of rehabilitation after completion of rehabilitation and after three months to determine the effectiveness of the rehabilitation procedures.

KEYWORDS: parkinsonism, rehabilitation, speech therapy

SAŽETAK:

MULTIDISCIPLINARNI PRISTUP REHABILITACIJI PACIJENTA S PARKINSONIZMOM – PRIKAZ SLUČAJA

71-godišnji pacijent upućen je na rehabilitaciju u uznapređenoj fazi parkinsonizma. Bolesnik je imao usporen hod, posturalnu nestabilnost, bradikineziju, blago povišen tonus gornjih udova, diskretni tremor desne šake, hipomiju i hipofoniju. Multidisciplinarni rehabilitacijski tim sastojao se od fizičara, neurologa, otorinolaringologa, patologa govornog jezika, profesionalnog terapeuta, fizioterapeuta i medicinskog tehničara. Individualizirani plan rehabilitacije uključivao je multimodalnu fizioterapiju, radnu terapiju i govornu terapiju. Za procjenu učinaka rehabilitacije nakon završetka rehabilitacije i nakon tri mjeseca za utvrđivanje učinkovitosti rehabilitacijskih postupaka korišteni su standardizirani testovi.

KLJUČNE RIJEČI: parkinsonizam, rehabilitacija, logopedska terapija

INTRODUCTION

Atypical and secondary parkinsonisms are disorders that are presented with the symptoms of Parkinson’s disease but have a different etiology. Causes of atypical parkinsonism include neurodegenerative diseases such as multiple system atrophy, progressive supranuclear palsy, corticobasal degeneration and frontotemporal dementia, while secondary parkinsonism is due to head injuries, especially repetitive injuries, infections, certain medications and toxins. Parkinsonism is manifested by motor symptoms such as resting tremor, muscle rigidity, bradykinesia, postural instability and gait instability, as well as non-motor symptoms such as memory loss, anxiety, depression, dysphonia, dysarthria, dysphagia and urinary incontinence. If possible, the cause of the parkinsonism is treated. However, if the cause cannot be treated, medication is used to alleviate the symptoms. Levodopa can alleviate the symptoms of the disease in some cases but is not as effective as in the treatment of Parkinson’s disease. In addition to pharmacological treatment, rehabilitation is recommended (1).

CASE

A 71-year-old patient with parkinsonism was referred to a physiatrist. Five years ago, he was examined by a neurologist for hand tremors, impaired balance, slow gait and memory problems. He first noticed these symptoms in the 1990s and links their occurrence to his time as a prisoner of war, when he received several blows to the head. The recommended brain CT showed an initial diffuse cortical atrophy. The neurologist introduced levodopa. After one year, the levodopa dose was increased due to the advanced symptoms. At the follow-up examinations, an attempt was made to reduce the levodopa dose, but it was increased again due to the worsening of symptoms. The patient was in an advanced stage of parkinsonism. On examination, a slow gait with the aid of a cane, hypomimia,

hypophonia, slowed execution of rapid movements, slightly increased upper limb tone and a discrete tremor of the right hand were noted. The patient reported occasional falls. Standardized tests were performed to assess balance, gait speed, mobility and quality of life (Table 1). The Berg Balance Scale (BBS) was used to test balance. It consists of 56 points in total, with a lower score indicating impaired balance. The patient had an impaired functional balance with a risk of falling. The 4-meter walk test (4MWT) was used to measure gait speed. Walking speed is normal when a person covers 4 meters in 5 seconds (0.8m/s). The patient had a reduced gait speed. The Timed Up and Go Test (TUG) was used to assess functional mobility. The patient’s mobility was reduced and there was an increased risk of falling. The impact of the disease on quality of life was assessed using the Parkinson’s Disease Questionnaire-8 (PDQ-8). A higher score on the questionnaire indicates a lower quality of life. The patient completed the PDQ-8 himself. In the PDQ-8, the patient reported difficulties in getting around outside the house, dressing, verbal communication and concentration. Given the decreased balance, gait speed and mobility and increased risk of falling, an individualized rehabilitation plan was created that included stretching exercises, lower extremity strength exercises, balance exercises on a stabilometric platform, gait exercises on the floor, quadriceps electrostimulation and occupational therapy. The rehabilitation program aimed to improve balance, gait speed and mobility, reduce the risk of falling, increase independence in activities of daily living and improve quality of life. The rehabilitation program lasted four weeks. After completion of the rehabilitation, the standardized tests were repeated (Table 1). The patient had improved balance. Gait speed was increased. Mobility was also improved. The quality of life according to PDQ-8 remained the same.

Table 1. The results of the assessment of balance, gait speed, mobility and quality of life

	Before rehabilitation	After rehabilitation	Three months after
Berg Balance Scale (BBS)	45 points	51 points	45 points
4-metres walk test (4MWT)	0.42 m/s	0.53 m/s	0.66 m/s
Timed Up and Go Test (TUG)	24.4 s	17.87 s	20.56 s
Parkinson’s Disease Questionnaire-8 (PDQ-8)	12	12	7

Three months after the completion of rehabilitation, the tests were repeated to determine the long-term effects of rehabilitation (Table 1). The positive effects on balance were no longer present after three months. Mobility decreased over the three months, but remained better than before rehabilitation. Only gait speed remained the same, or more precisely, had increased. The patient continued to use a walking cane for stabilisation. In the PDQ-8, the patient reported an improved quality of life. He also reported that he had fallen in the bathroom one month after completing therapy. The patient was referred to a speech-language pathologist (SLP) for hypophonia and dysarthria, and a comprehensive SLP evaluation was conducted. The voice was evaluated objectively and perceptually (Table 2). The acoustic analysis was performed with the computer programme Praat (2), which measures the fundamental frequency of the voice, the intensity level, the number of voice breaks, the jitter, the shimmer and the harmonics-to-noise ratio. The perturbation measures of jitter and shimmer were high before rehabilitation, indicating hoarseness of the voice. After rehabilitation, the jitter normalised, while the shimmer decreased but remained above normal. The intensity of the voice was reduced due to inadequate breath support and limited adduction of the vocal folds. The GRBAS scale (3) was used for

the perceptual evaluation of the voice. The categories of grade, roughness, asthenia and strain remained the same before and after rehabilitation, while breathiness decreased, probably due to better breath control. Due to hoarseness, the SLP referred the patient to an otorhinolaryngologist. During the otorhinolaryngological examination, fiberendoscopy revealed atrophy of both vocal cords, which was more pronounced on the right side. During phonation, the vocal cords did not achieve complete closure, which explains the results of the acoustic analysis. The prosody of the speech was monotonous and there were frequent irregular pauses. A motor speech examination was conducted in which strength, symmetry, range, tone, steadiness, speed and accuracy of oral movements were assessed. As expected, performance was weaker in all these categories, which had a negative impact on articulation. In speech therapy, therapeutic interventions focused on improving vocal quality, volume and articulation (4,5). Techniques included respiratory exercises to improve breath support, vocal exercises to strengthen the vocal muscles, and articulation drills to promote intelligibility. In addition, the SLP used strategies such as exaggeration of speech movements, cueing techniques (6) and voice modulation exercises to improve speech intelligibility and fluency.

Table 2. The results of aerodynamic, acoustic and perceptual voice evaluation

		Before rehabilitation	After rehabilitation	Three months after rehabilitation
	Maximum phonation time (MPT)	10 sec	13 sec	12 sec
	Maximum friction time (MFT)	20 sec	23 sec	20 sec
	Intensity (I_0)	57.901 dB	65.7 dB	57.708 dB
	Mean pitch (F)	113.405 Hz	110.923 Hz	107.528 Hz
	Number of voice breaks (NVB)	0	0	0
	Jitter	1.498%	0.625%	0.842%
	Shimmer	0.700 dB	0.492 dB	0.542 dB
	Mean harmonics-to-noise ratio (HNR)	13.145 dB	17.656 dB	13.222 dB
GRBAS scale	Grade	1	1	1
	Roughness	1	1	1
	Breathiness	2	1	1
	Asthenia	2	2	2
	Strain	0	0	0

DISCUSSION

As the patient presented with various motor and non-motor symptoms, multidisciplinary rehabilitation was required. The multidisciplinary team consisted of a physiatrist, a neurologist, an otolaryngologist, a speech-language pathologist, a physiotherapist, an occupational therapist and a medical technician (Figure 1).

The patient was referred for rehabilitation at an advanced stage of the disease in which the effectiveness of rehabilitation measures is limited. Unfortunately, patients are usually referred for rehabilitation at later stages of the disease, when they already have limited mobility, postural instability and a high risk of falling (7). Rehabilitation included multimodal physiotherapy, occupational therapy and speech therapy. The multimodal therapy included stretching exercises, strength exercises, balance exercises, gait exercises and electrostimulation of the quadriceps. Strength exercises increase muscle strength and consequently improve balance and gait. Gait exercises improve gait speed, stride length and walking capacity. Balance exercises improve balance, gait, and motor functions and reduce the frequency of falls (8,9). However, an increased risk of falling was observed in patients with severe motor deficits after balance exercises. One possible explanation is that patients in an advanced stage of the disease have an increased subjective sense of balance after balance training. This is why they are more likely to get into challenging situations for which they do not have sufficient balance (7). The multimodal approach, which includes three or more modalities of kinesitherapy, has been shown to have a positive effect on motor functions, independence in activities of daily living and quality of life (8). Compared to standard physiotherapy, multimodal therapy leads

to a significant improvement immediately after completion of therapy and up to one year afterwards (10).

After multimodal therapy, there were positive effects on balance, mobility and walking speed. Despite the improvement in balance and gait, the patient fell one month after completing rehabilitation. In the advanced stage of the disease, the balance exercises did not significantly reduce the risk of falling. After 3 months, only the increased gait speed was still present. Other studies have shown that strength exercises had positive effects for up to 3 months, while gait exercises had positive effects for up to 6 months and balance exercises for up to 12 months in patients in the early and moderate stages of the disease (8). A possible reason for the more rapid loss of achieved progress is the advanced stage of the disease, when we cannot expect the same results as in the rehabilitation of patients in the early stages of the disease. Furthermore, the patient did not exercise after completing the therapy. Patients can maintain the positive effects of rehabilitation through continuous exercise.

CONCLUSION

The course of parkinsonism is chronic and progressive, leading to disability and reduced quality of life. In addition to pharmacological therapy, which can alleviate symptoms to a certain extent, rehabilitation is an important part of treatment. Multidisciplinary rehabilitation aims to slow down the progression of motor deficits and thus the disability, increase independence in activities of daily living and improve quality of life. Patients should be referred for rehabilitation in the early stages of the disease when the rehabilitation measures are most effective.

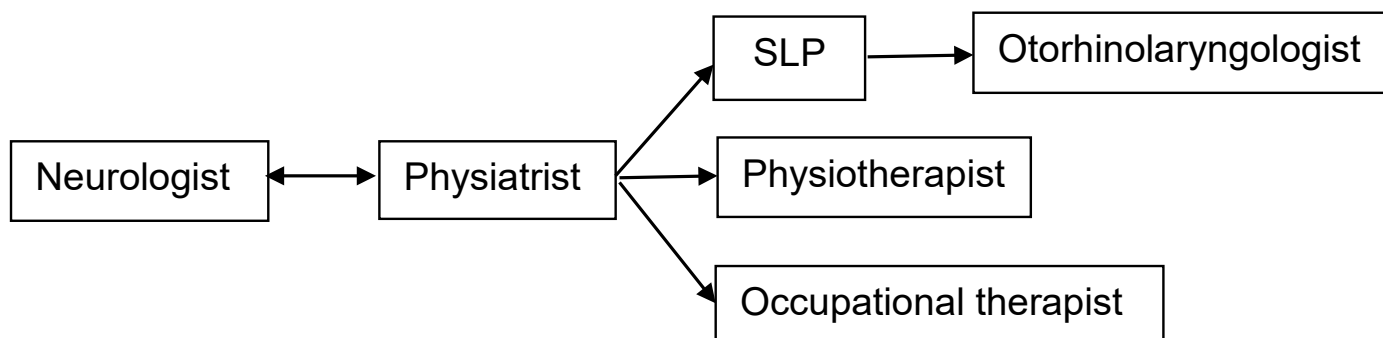


Figure 1. Multidisciplinary rehabilitation team

REFERENCES

1. McFarland NR. Diagnostic Approach to Atypical Parkinsonian Syndromes. *Continuum (Minneap Minn)*. 2016;22(4):1117-42.
2. Boersma P, Weenink D. Praat: doing phonetics by computer [Computer program]. Available at: <http://www.praat.org/>. Accessed 17 March 2024.
3. Hirano M. *Clinical examination of voice*. New York, MO: Springer Verlag, 1981.
4. Gibbins N, Awad R, Harris S, Aymat A. The diagnosis, clinical findings and treatment options for Parkinson's disease patients attending a tertiary referral voice clinic. *J Laryngol Otol*. 2017;131(4):357-362.
5. Xu H, Bao Z, Liang D, Li M, Wei M, Ge X, et al. Speech and Language Therapy for Voice Problems in Parkinson's Disease: A Meta-Analysis. *J Neuropsychiatry Clin Neurosci*. 2020;32(4):344-351.
6. Moya-Galé G, Levy ES. Parkinson's disease-associated dysarthria: prevalence, impact and management strategies. *Research and Reviews in Parkinsonism*. 2019;9:9-16
7. Ellis TD, Colón-Semenza C, DeAngelis TR, Thomas CA, Hilaire MS, Earhart GM, et al. Evidence for Early and Regular Physical Therapy and Exercise in Parkinson's Disease. *Semin Neurol*. 2021;41(2):189-205.
8. Mak MK, Wong-Yu IS, Shen X, Chung CL. Long-term effects of exercise and physical therapy in people with Parkinson disease. *Nat Rev Neurol*. 2017;13(11):689-703.
9. Radder DLM, Lúgia Silva de Lima A, Domingos J, Keus SHJ, van Nimwegen M, Bloem BR, et al. Physiotherapy in Parkinson's Disease: A Meta-Analysis of Present Treatment Modalities. *Neurorehabil Neural Repair*. 2020;34(10):871-80.
10. Monticone M, Ambrosini E, Laurini A, Rocca B, Foti C. In-patient multidisciplinary rehabilitation for Parkinson's disease: A randomized controlled trial. *Mov Disord*. 2015;30(8):1050-8.

