

**EFFECTIVENESS OF PHYSICAL THERAPY IN IMPROVING FUNCTIONAL
STATUS OF PATIENTS WITH ATYPICAL PARKINSON'S**

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ABSTRACT

This paper describes the effectiveness of participation in a physical therapy program for patients with atypical parkinsonism, who typically respond poorly to pharmacological intervention and thus degeneration of neurological and motor function tends to progress quickly. Atypical parkinsonism encompasses several disorders which have unique characteristics, specific to the disease or individual, which commonly result in akinesia, gait difficulties, rigidity, and cognitive decline¹. The terminal manifestation of the disease is a patient who effectively loses their ability to execute activities of daily living, with increasing disability tied closely to a decline in quality of life. A review of the literature aims to address whether the patient's functional ability and therefore quality of life can be improved with physical rehabilitation and stretches. The evidence supporting rehabilitation in idiopathic Parkinson's disease was a catalyst to investigating the impact of such treatment on patients with atypical parkinsonism.

CASE HISTORY

An 83-year-old female patient admitted to the Gimli Community Health Centre for an NSTEMI. Ten years ago, this patient became aware of a tremor, which initially only affected the left hand, but later would present in the left leg as well. The tremor came on gradually, unilaterally and was most prominent with manual activity. The patient is unable to grasp objects with her left hand, and when she stands up her left leg shakes. These two clinical presentations make walking difficult and her biggest problem is maintaining balance and preventing falls. Three years ago, she began to fall backwards, and this resulted in her fracturing her hip in the fall of 2018, in addition to falling in her bathroom in the winter of 2019, which resulted in head trauma. These incidents culminated in her having to use a wheelchair for ambulation. Focused examinations of the patient reveal that her speech is slightly dysarthric, she has an erratic left upper extremity which is precipitated by limb movement and is held in a posture of flexion at the elbow, wrist and inter-phalangeal joints due to increased appendicular tone. The right side presented with normal speed and movement, but the left side was slow and impaired. There is evident cog-wheel rigidity in the upper left extremity. Her past medical history includes dyslipidemia, hypothyroidism and hypertension. She has a paternal aunt with a tremor, of which the diagnosis is unknown. Her treatment was initially Levodopa, which was started because the neurologist suspected that she presented with a resting tremor, however the drug failed to improve the condition and was discontinued. On re-evaluation the tremor was deemed to be an intention tremor. In addition, she was started on 900mg of Glucosamine/Chondroitin sulfate per day. Her diagnosis of CBD in March of 2019 was due to her physical findings, an unremarkable MRI for cerebellar lesions and a neurodegeneration with parkinsonism traits that is not L-dopa responsive. CBD currently has no known cure. The movement disorder clinic recommended a trial of focal botulinum toxin injections (Dysport) to the left arm to see if the tone would be reduced. The results of these injections were not clear to me at the time of meeting the patient. The second part of her treatment plan was a recommendation of physiotherapy and a speech-

EFFECTIVENESS OF PHYSICAL THERAPY IN IMPROVING FUNCTIONAL STATUS OF PATIENTS WITH ATYPICAL PARKINSONS

language pathology review. The patient reported feeling the benefits of the physiotherapy and stretching exercises after only a few sessions.

INTRODUCTION

Atypical parkinsonism (AP) describes disorders that present with characteristic parkinsonism traits such as tremors, rigidity, akinesia and postural instability but are not caused by Parkinson's disorder². There are four main disorder which fit under the category of AP, these being progressive supranuclear palsy (PSP), corticobasal degeneration (CBD), multiple system atrophy (MSA) and Lewy body dementia (LBD)³. These four disorders are also classified by their pathogenic mechanisms, namely the protein aggregation of alpha-synuclein and tau in the brain. PSP and CBD are considered tauopathies, while MSA and LBD are synucleinopathies³. The tauopathies will be the focus of this paper as the subject of the case study done in the Gimli Community Health Centre had a diagnosis of CBD when she presented to the emergency department. Although, both PSP and CBD are tauopathies, they differ in several ways. Corticobasal degeneration is characterized by an asymmetrical rigid syndrome with cortical dysfunctions which can impair executive function, language, social behavior and sensory loss¹. The basal ganglia, prefrontal cortex, parietal lobe and corpus collosum are the brain regions most affected. Diagnoses of CBD typically occurs in the sixth decade of life with a prognosis of 7-10 years after diagnosis². Mortality is often the consequence of complications with immobility and dysphagia². At the present time, there is limited understanding of how to manage the protein aggregation or neurofibrillary tangles of this disease, so treatment at the pathophysiological level is hindered. Thus, the aim of treatment becomes physical rehabilitation, which is essential to minimizing the mortality risks associated with immobility in these patients. Therefore, this paper aims to look broadly at the results of physical therapy studies done in patients with CBD and PSP to determine whether this is an effective measure in preventing unprovoked falls and improving functional status.

LITERATURE REVIEW

A literature review was conducted on PubMed to determine what studies were done on patients with corticobasal degeneration, or atypical Parkinson in relation to physical therapy. Using the terms (("Basal Ganglia Diseases"[Mesh]) OR corticobasal syndrome) AND "Exercise Therapy"[Mesh] there were 603 articles. This search was filtered to narrow the results. The filters added were "published in the last 5 years," "humans" and "aged 65+" which produced 178 articles of which 2 were relevant. Other searches such as (("Supranuclear Palsy, Progressive"[Mesh]) OR "Movement Disorders"[Mesh]) AND "Exercise Therapy"[Mesh] produced a lot of articles but again only two relevant articles. Other attempts searching ("Tauopathies"[Mesh]) AND "Physical Therapy Modalities/rehabilitation"[Mesh] or (((atypical parkinsonism) OR "Tauopathies"[Mesh]) OR corticobasal degeneration) AND "Physical

EFFECTIVENESS OF PHYSICAL THERAPY IN IMPROVING FUNCTIONAL STATUS OF PATIENTS WITH ATYPICAL PARKINSONS

Therapy Modalities/rehabilitation"[Mesh] produced no results. There are evidently limited studies done on this topic, but through a google search 2-3 other relevant articles were found.

DISCUSSION

This paper analyzed the literature to investigate the effectiveness of physical rehabilitation programs for patients with AP. Although there are limited studies and case reports done on this topic, the studies do reveal a positive effect of physical therapy in AP patients. Hohler et al analyzed ninety-one patients with AP who participated in an inpatient movement disorder program. The study compared results for these patients at admission and on discharge. They were scored on a variety of scales, including the functional independence measure (FIM), timed up and go test (TUG), two-minute walk test (TMW), Berg balance scale (BBS) and finger tapping test (FT) (see Table 1). The subjects received therapy for a minimum of 3 hours per day for 5-7 days per week. The study reported that all the patients showed significant improvement on discharge ($P > 0.001$). According to previous studies, the minimal clinically important difference of total FIM is 22, and based on this cut-off, seventy four percent of their patients had scores above that threshold. Strengths of this study included the large sample size, the variety of disorders, and the advanced disability stages of the patients⁴.

Furthermore, a 2007 case report of a 72-year-old patient with mixed PSP and CBD, investigated the effect of a 2.5-year period in which the patient routinely participated in an exercise group for people with Parkinson disease (mat exercise and treadmill training) and intermittent participation in individual locomotor training on a treadmill. Over the 2.5-year period, fall frequency decreased, and tests of functional balance showed improved limits of stability (functional reach tests) and maintained balance function (Berg Balance Scale). Tests of walking performance showed only slight declines. A 4-wheeled walker was introduced and accepted by the client early in the intervention period. The client, with supervision, remained ambulatory with this wheeled walker in the community¹.

A 2014 ten-year case report follow up of a man in his seventies diagnosed with CBD and PSP examined the effects of exercise participation on both functional status and brain volume. The program included trunk and lower extremity stretching and strengthening, upright balance and strengthening, and both forward and backward treadmill walking. The client participated twice weekly for 1 hour for 10 years and was reassessed in years 9 to 10. He had reduced fall frequency (from 1.9 per month during year 1 to 0.3 at year 10), maintained balance and endurance, and retained community ambulation using a walker. Quantitative brain measurements indicated a slow rate of whole brain volume loss and ventricular expansion compared with clients with autopsy-proven CBD or PSP. The paper supported the efficacy of a regular exercise program to prolong longevity and maintain function in people with CBD or PSP².

A 2009 study in a CBD patient studied the effect of repetitive facilitation exercise on hand function. This exercise included movements of each isolated finger using stretch reflex and skin-

EFFECTIVENESS OF PHYSICAL THERAPY IN IMPROVING FUNCTIONAL STATUS OF PATIENTS WITH ATYPICAL PARKINSONS

muscle reflex and repetitive movements demanded in activities of daily living (ADL) and manipulating objects. After 1 month of treatment, the patient's difficulties in ADL, including wearing clothes, manipulating objects and cooking, decreased⁵.

The results of these studies show that there is a measurable benefit to AP patients as a result of the rehabilitation programs. However, there are some limitations to this literature review. Firstly, not all the papers used the same scales to measure outcome. Moreover, the length of follow up varied from one week to ten years. The patients from each study underwent different exercise programs and for varying frequencies. These are variables that would need to be controlled in order to have a more comprehensive analysis of the effects of physical therapy. The clinical importance of physical therapy is potentially of greater value to AP patients when compared to those with idiopathic Parkinson, due to the less than optimal effectiveness of medical treatment in AP. Furthermore, a better understanding of physical therapy's effect on AP can lead to better management of the direct and indirect impairments associated with AP⁶ (see Figure 1). A future research question that would provide further value to these patients is comparing the benefits of a rehabilitation program in outpatient versus inpatient groups.

CONCLUSION/SUMMARY

Patients with atypical Parkinson's suffer from a neurodegenerative disease which presents with traits similar to Parkinson's disorder, but has a different pathophysiology and lacks responsiveness to Parkinson drug treatments, namely L-dopa. These patients, due to a lack of cure, degenerate quickly and mortality is often due to complications of immobility and dysphagia. The value of physical therapy is a minimization of immobility risks, such as preventing falls, improving balance and stability, and enhancing quality of life and the ability to execute activities of daily living. A literature review exhibits a measurable benefit of physical therapy to AP patients. However, the variation in lengths of follow up, outcome measures, frequency and types of exercise programs across the studies limits the ability to comprehensively analyze the relationship between improved functional status and physical therapy in this patient group. Further controlled trials addressing this question would provide great insight on how to better manage AP patients, which could allow future research into inpatient versus outpatient benefits.

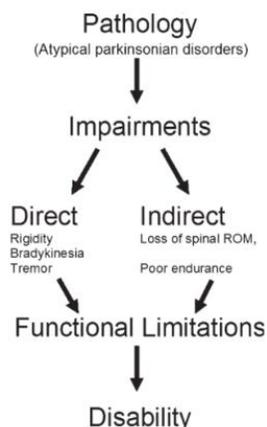
EFFECTIVENESS OF PHYSICAL THERAPY IN IMPROVING FUNCTIONAL STATUS OF PATIENTS WITH ATYPICAL PARKINSONS

APPENDIX

Table 1- Outcome Measures and Descriptions

Measure	Description
FIM	18-item assessment of disability among inpatient rehabilitation patients. The FIM measures ability to perform basic life activities, such as self-care, sphincter control, transfers, locomotion, communication, and social cognition. Each item is scored on a scale from 1 to 7, in which 1 is patient requires total assistance to complete the task and 7 is complete independence. The FIM can be divided into 2 sections: motor (13 items) and cognitive (5 items). It has been shown to have good reliability and validity.
TMW	The TMW is performed by asking subjects to walk as far as they can in 2 minutes. Patients with PD have been shown to cover less distance than age-matched controls
TUG	Assesses a patient’s ability to transfer from sitting to standing, ambulate, and make a turn. Patients are timed while rising from a chair, walking 3 m, turning, walking back to the chair, and sitting down
BBS	14-item scale assessing balance while sitting, standing, turning, and reaching forward. Items are rated from 0 to 4, with 0 meaning the subject needs assistance or is unable to perform the task and 4 meaning the subject can perform the task safely and independently.
FT	Timed test useful in assessing the impact of bradykinesia on rapid alternating movements of the upper extremity. Two buttons are attached to a counter 30 cm apart. Subjects are asked to alternate tapping each button with their left hand for one minute. The sum of the taps is the score for that hand. The test is repeated with the right hand.

Figure 1- Disability Model



EFFECTIVNESS OF PHYSICAL THERAPY IN IMPROVING FUNCTIONAL STATUS OF PATIENTS WITH ATYPICAL PARKINSONS

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