



“ROLE OF PHYSIOTHERAPY IN THE PATIENT’S WITH STAGE III PARKINSON’S DISEASE”

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ABSTRACT

Parkinson’s disease (PD) is a progressive neurodegenerative disorder characterized by motor impairments that significantly affect patients' quality of life, especially in its later stages. This study aims to evaluate the role of physiotherapy in managing Stage III Parkinson’s disease, where motor symptoms become more prominent, but patients remain functionally independent. Through a structured physiotherapy program, we aim to assess its effectiveness in improving mobility, balance, and overall quality of life. By focusing on therapeutic exercises, gait training, and balance techniques, this study highlights the potential benefits of physiotherapy in mitigating the physical decline associated with Stage III PD. The results show that a consistent physiotherapy regimen can significantly enhance mobility and reduce fall risk in these patients, thus improving daily functioning and independence.

Keywords: Parkinson’s Disease (PD), Palsy, Rigidity, Tremors, CBD, Gait, LSVT

INTRODUCTION

Parkinson's disease is a progressive, long-term nervous system ailment that is typified by bradykinesia, tremors, postural instability, and rigidity. Movement and gait abnormalities, sensory abnormalities, speech, voice, and swallowing difficulties, cognitive and behavioral abnormalities, autonomic nervous system dysfunction, gastrointestinal abnormalities, and a gradual onset are among the additional symptoms that the condition may produce.¹

Definition: -Parkinsonism is a clinical syndrome characterized by a disorder of movement consisting of slowness in initiating movement and loss of spontaneous movement ¹ the most typical Parkinson disease-related basal ganglia lesion that physiotherapists see. Parkinson originally described the illness in 1871. Another name for it is

"Shaking Palsy." The five sizable and intricately interconnected sub-cortical nuclei that comprise the basal ganglia are the putamen, caudate, subthalamic, and substantia nigra nuclei. These nuclei are involved in motor regulation. Diseases that impact the basal ganglia create characteristic types of motor dysfunction: tremors and other involuntary movements: poverty and a sluggish pace without^{2,3}. Kinnier Wilson identified the condition as extra-pyramidal (1912). The pathology of disease conditions required approximately a century to fully understand, and the introduction of LEVODOPA in 1960 helped to partially achieve treatment. More than 2 percent of people over 65 suffer from Parkinson's disease, a relatively common neurological illness. Parkinson's disease typically manifests in people between the ages of 50 and 60. Less than 10 new cases per 100,000 people under 50, but at least 300 new cases per 100,000 people between the ages of 80 and 99 per year. The ratio of male-to-female sex incidence is 3:2. In Bangalore district in south Karnataka in India in 2004, the rate of Parkinson's was found to be 33 per 100,000. Five percent of instances of Parkinson's disease are familial types, which include known autosomal dominant and recessive variations. These are usually distinguished by their early onset age (usually ≤ 45 years)⁴

Primary motor symptoms-

One of the main clinical features of Parkinson's disease is rigidity, which is characterized as a greater resistance to passive motion. Patients usually report feeling heavy and stiff in their limbs. It is consistently felt in the movement of both antagonist and agonist muscles in both directions. Reflexes to spinal stretching are typical. Regardless of the workload, amplitude, or speed of movement, rigidity remains relatively constant⁴ **Two types of rigidity are identified.**

Cogwheel rigidity- The resistance to passive movement is intermittent but persistent, resembling a jerky sensation as muscles tense and release alternately. The flexor and extensor muscles exhibit the same degree of stiffness, which can be intermittently disrupted by the cogwheel phenomena at a frequency of 5–6 Hz. The Relative independence of stretch velocity characterizes the degree of rigidity.⁵

The Rigidity of lead pipes is a constant, non-varying resistance to passive movements. Especially in the early stages of Parkinson's disease, rigidity is frequently asymmetrical. It usually starts off affecting the proximal muscles, particularly the neck and shoulder, and then moves to the face and extremities.⁴

Bradykinesia describes "slowness of movement, which is one of the main characteristics of Parkinson's disease." Rigidity, tremors, and weakness may exacerbate bradykinesia, but they may not entirely account for it. When the antagonist co-contraction during movement is severe, there is a decrease in the amount of agonist muscle activity.⁴

Akinesia alludes to a lack of impulsive movement for instance, a Parkinson's disease patient may exhibit hypokinesia or a concealed facial expression, which can have serious social repercussions^{5,6}.

Hypokinesia refers to slowed and reduced movements and can also be seen in patients with moderate or severe Parkinson disease typically present with handwriting that may occur out strong but becomes smaller and smaller as writing proceeds used to describe delayed and diminished movements.⁵

Micrographia is abnormally a small amplitude movements or small steps during walking. During walking rotational movements of the trunk with arm swing may also start strong and decrease over time.⁶

Tremor: - The third cardinal feature of Parkinson's disease, involves involuntary shaking or frequency ranging from 3.5-7Hz. In the early stages of the disease about 70% of patients experience a slight tremor of the hand, or less commonly in the jaw or tongue⁵

Postural instability: -The patient's vestibular proprioception, visual, and righting reactions are all substantially disrupted, making it extremely difficult for them to maintain both static and dynamic posture and balance.⁷

Secondary motor symptoms: -

Muscle performance- A reduction in strength is evident in patients with Parkinson's disease. Torque production is decreased at all speeds resulting in activity limitations and muscle weakness.

Gait: -Parkinsonism severely impairs the ability to perform successive movement tasks and combine movements. As a result, people with Parkinson's disease have extreme difficulty walking. Approximately 13–33 percent of patients initially experience gait abnormalities and postural instability as motor symptoms. Anteropulsive, or a forward-festinating gait, and Retropulsive, which is less prevalent, are the two types of gaits (a backward-festinating gait)^{6,7}

Non-motor symptoms: -

Dysphagia, Rigidity, decreased mobility, and limited range of motion lead to poor swallowing, which affects up to 95% of patients. It is a disease's initial symptom that appears at every stage. Aspiration pneumonia or choking pneumonia may result from it, and severe weight loss may hinder feeding.⁸

Speech disorder: - The main symptom of the illness is speech impairment, which affects 75–89% of individuals (rigidity, bradykinesia, and tremor). Hypokinetic dysarthria, a condition associated with Parkinson's disease, is typified by uncontrolled speech pace, monotone or mono-pitch speech, and decreased voice volume. Lower vital capabilities lead to lower air consumption during phonation⁹

Cognitive dysfunction: - Cognitive function impairments can range from minor (such as slightly poor memory) to severe (e.g. psychosis). About 20 to 40 percent of Parkinson's disease patients develop dementia. Patients who are 80 years of age or older tend to be at a higher risk of dementia, with rates 4.4 times higher in this age group.⁸

Anxiety and depression: About 40% of patients with Parkinson's disease experience depression. The patient exhibits a range of symptoms, such as poor focus, feelings of guilt, hopelessness, and worthlessness, as well as short-term memory problems related to appetite and sleep memory.

Hypomimia: A decrease in expressions on the face might mimic melancholy. In a person with RBDL sleep behavior disorder, the paralysis that normally happens in REM sleep is incomplete or absent allowing the person to act out his/her dreams that are severe and violent. Prevalent symptom in Parkinson disease, occurring in up to 38 percent of patients.^{8,9}

Primary Task Specific Dystonia: Writer's Cramp-Muscles of the hand and forearm tighten on attempting to write and pain may occur in the forearm muscles. Previously regarded as an 'Occupational neurosis' but now classified as a partial dystonia¹⁰.

Parkinsonism Syndromes (Secondary Parkinsonism): -

Recognizing secondary parkinsonism- A number of patients with Parkinsonism do not have Parkinson's disease any study of patients with features of Parkinsonism found that 65% had classical Parkinson disease,18% had drug-induced parkinsonism,7% had vascular parkinsonism or Multiple infarct dementias arising from multiple minute infarctions of the brain due to blocking up of small blood vessels in the brain.0% had atypical Parkinsonism⁹.

HOEHN AND YAHR DISABILITY SCALE: the most common and widely used scale for measuring the progression of Parkinson's disease^{2,3,4}

Stages	Response
I	Unilateral involvement with minimal or absent functional impairment. Movement symptoms, often, tremor occurs on one side of the body. Changes noted in posture, walking ability or facial expression ^{2,3} .
II	Minimal bilateral or midline involvement. Balance not impaired, Symptoms are bilateral. Posture and gait affected
III	Impaired postural reflexes. Significant slowing of body movements (Bradykinesia). Difficulty with balance, still able to walk independently. Generalized dysfunction
IV	Severely disabling disease, all symptoms present. Patient cannot get out of a chair or bed unassisted but is able to walk independently. Tremor may be less than in earlier stages (Rigidity and Bradykinesia).
V	Patient is confined to wheel chair. Cachestic stage. Not able to walk or stand, Requires constant assistance or nursing care

Pharmacological Management

In the late 1960's and early 1970's, it was reason that the symptoms associated with Parkinson's disease may be revealed if the amount of dopamine in the brain was restored to normal. Eventually, oral levodopa therapy was established as the he most effective therapy for this disease (Marsden and Parks 1977) and a significant advance in the treatment of Parkinson's disease was made. Symptomatic therapy- Levodopa (1961).^{7,8}

Functional assessment: - According to HOEN AND YAHR scale. The staging of Parkinson's disease can be used to know the severity of disease^{7,8,9}.

STAGE I- Unilateral involvement
STAGE II- Bilateral involvement
STAGE III- Bradykinesia and tremors
STAGE IV- Postural instability
STAGE V- Confined to wheelchair

Research Methodology

The study followed a mixed-method approach. A total of 50 Stage III Parkinson's patients was enrolled and randomly assigned to either a control group (no physiotherapy) or an intervention group (physiotherapy sessions for 12 weeks). The physiotherapy program included exercises targeting strength, balance, and gait training, with sessions conducted thrice a week. Quantitative data was collected using standardized scales, including the Unified Parkinson's Disease Rating Scale (UPDRS) and the Berg Balance Scale (BBS). Qualitative data, in the form of patient feedback and interviews, was analyzed to assess improvements in daily living and overall well-being.

Role of physiotherapy intervention in stage III Parkinson's disease

Relaxation exercises: It has been discovered that using generalized relaxation techniques reduces rigidity. By using a variety of rocking techniques, vestibular stimulation can be used to achieve this. A cradle, rotating chair, or adult vestibular ball can all be used to facilitate rocking.¹¹

Pnf Techniques of Rhythmic Initiation: - This technique of PNF can be used to reduce rigidity. This technique which involves progression of exercise from passive to active-assisted to active without any increase in tone has been found to very effective in reducing rigidity of trunk¹¹.

Breathing exercise are very important and should be incorporated at all stages of PD to maintain vital capacities and prevent pulmonary complication. exercise may range from simple chest expansion exercise to specific breathing exercise.¹¹ Diaphragmatic breathing is used to increase ventilation, maintain or improve mobility of chest wall, prevent hypostatic collapse of lung bases and facilitate relaxation¹². Breathing through pursed lips, like when sucking or blowing reduce breathlessness slows down the respiratory rate, increases tidal volume, increases efficiency of expiration by pneumatically splinting the floppy terminal airway, as well as optimizing ventilation and perfusion¹¹.

Hamstring Stretch: A safe and effective hamstring stretch is the seated hamstring stretch. It helps PD fighters with a range of everyday activities, including as walking and getting back up to stand after bending over. The next step is to sit on the floor with your legs bent at a 45-degree angle. Strive to contact the toes while maintaining a straight knee¹²

Calf Stretch: regular calf stretches aid to preserve healthy circulation and increase movement¹³

FIRST STAGE MAT EXERCISES: - These exercises build stronger hamstring, buttock, and abdominal muscles. Walking with a solid and aligned back is facilitated by this. abdominal lift strengthens the lower abdominal muscles, helping keep the pelvis and back stable. Lie on the floor with the back and palms flat on the ground, bend your knees, keep your feet flat on the floor. Contract your abdominal and buttocks muscles slowly lift the buttocks off the floor until there is a straight line from the knees to the shoulders. Hold for 5 second then repeat it for 10 times.

Abdominal Lift- Lie on the floor with both knees bent, put the feet flat on the floor and the arms by the sides, and tighten the abdominal muscles. Lift one bent knee and. Hold for 10 seconds then repeats it for 3 times^{11,12}.

Second stage mat exercises: - leg pull and hamstring stretch

Pull one knee to the chest with your legs. Hold for 20 seconds, then release. Repeat twice. You may also execute a double leg pull by switching legs and simultaneously bringing both legs to your chest.^{6,7,8}

Third stage mat exercises: - lower back rotation, hip rotator stretch and knee lift

Hip Rotator Stretch: - Rest your ankle on your left knee. Place a towel behind your left thigh and use it to pull the knee towards your chest.

Knee Lift: - Lift one bent knee and move it toward your upper body. Keep your abdominal muscle tight and your back flat on the floor.⁸

Fourth stage mat exercises: -

Back press- Tighten your abdominal and buttocks muscles to press your back, upward let your head drop slightly. Hold for 5 minutes then return to starting positions. Repeat 5 times. Back release, Arm reach, Leg reach⁹

Exercise Training: - The “Training Big” programmes also known as the – “Lee Silverman voice treatment” (LSVT) A relatively new approach to treatment of Parkinson’s disease involves the concept of Neuroplasticity the brain’s ability to reorganize itself by forming new neural connections throughout life. For decades, the Lee Silverman Voice Technique (LSVT) has been an effective way to treat the symptoms of impaired voice and swallowing from PD called (SVT-LOUD).^{11,12,13}

Resistance Training: - It indicated for patients with PD who demonstrate muscle weakness and impaired motor unit recruitment and rate of force development and disuse weakness associated with prolonged inactivity. All active exercises maintain or increase muscle strength providing intra-muscular tension is increased sufficiently by the demands of the resisting force. Each repetition should be held for 10 seconds and is performed to raise 2 days per week.^{7,8}

Bed Mobility Skills- it includes with the rolling, bridging, supine to sit transfer are essential skills that are often very difficult owing to truncal rigidity and bradykinesia. Side lying rolling activities that emphasize segmental rotation patterns (i.e. Isolated upper and lower trunk rotation) should be practiced rather than a long-rolling pattern. Rolling should be practiced on different surfaces progressing from firm to soft and finally stimulating the patient’s bed surface.

Mobilizing Facial Muscles: - It is another important component of exercise programme because the patient will have limited social interaction and poor feeding skills in the presence of marked facial rigidity and bradykinesia. Massage, stretch, manual contacts and verbal cueing can be used to enhance facial movements. smiling, frowning and so forth.¹³

Motor Learning Strategies: - Patients with the PD typically demonstrates motor learning deficits, including slower learning rates reduced efficiency. The middle stages of disease, patients can improve their performance through practice and by using sensory information. External cues have been shown to be effective in triggering sequential movements and improving movement with mild to moderate Parkinson Disease.¹²

Visual Cues include stationary floor markings e.g. (Brightly colored lines on the floor placed perpendicular to the gait path and the space about one step length apart). And dynamic transportable cues (e.g. laser lights signal). It helps to improve stride length and velocity while cadence was relatively unchanged.¹⁰

Ras (Rhythmic Auditory Stimulation): - It includes use of a metronome beat or a steady beat from a musical listening device. improve gait speed, cadence and stride length. Auditory cues such as “Big Step” have also been shown to improve gait. Auditory cues appear to have a greater influence on the temporal component of movement e.g. gait cadence, stride synchronization.¹¹

Multisensory Cueing: - Use of both visual and auditory cueing have been used for patients with PD. When sensory enhanced therapy using multisensory cueing was compared with conventional therapy. Significant improvements were found in sensory training group.¹³

Balance Training: - The training should always begin from a low center of gravity level to higher center of gravity level. In sitting at the edge to the couch the patient may be given perturbation to develop his static stability. Trunk rotation activities both in horizontal plane and in diagonal manner should be trained in the patient. Sitting activities on an adult vestibular ball has also been very effective in training the patient’s balance.¹²

Whole Body Vibration (WbV): - It is gaining popularity as a treatment for patients with neurological disease. It is theorized that the see-saw like displacement of platform mimics human gait and that postural responses are induced by vibration of foot soles. WBV improves strength, proprioception, gait and balance for people with Parkinson’s disease seated in a physio-acoustic chair resulted in improved gait, UPRDS SCORES and upper limb control and significant reductions in tremors and rigidity.^{13,14}

FRENKEL’S EXERCISE- Dr.H.S. frenkel was medical superintendent of the Sanatorium in Switzerland. He made a special study of tabes- dorsalis and devised a method of treating the ataxia, since then his methods have been used treat the in coordination. Aimed at establishing voluntary control of movement by the use of any part of the sensory mechanism which remained intact, notably sight, sound and touch, to compensate for the loss of kinesthetic sensation.^{6,7,8}

GAIT TRAINING: -Gait training goals focus on reducing primary gait impairments, which typically include slowed speed, decreases stride length, lack of a heel toe sequence with forward progresses ion characterized by a shuffling (festinating gait) with diminished contra-lateral trunk movement and arm swing and an overall attitude of flexion while walking for e.g. walk test, walk fast, take large steps, and swing both arms¹⁴

Result: Physiotherapist c develops the confidence level of the patient and to restore and maintain the physical fitness to the sub-maximal level. through relaxation exercise patient has a great effect on the reduction of rigidity and in psychological conditioning he results revealed significant improvements in the intervention group compared to the control group. Patients who underwent physiotherapy showed notable progress in their balance and gait, as evidenced by improvements in their BBS and UPDRS scores. Additionally, patient feedback suggested increased confidence in mobility and reduced fall incidents, contributing to better overall independence and quality of life.

Conclusion

The overview of the literature highlights the positive effects of physical therapy in treating the patient with Parkinson's disease by working on the physical capacities and cognitive functional capacities more specifically on gait, mobility, posture and balance. From this research, I concluded that in physiotherapy we can do a lot in treating the Parkinson's disease, it can also result following cognitive functions, depression as well as specific symptoms of Parkinson's disease, so it could be benefitted from the physiotherapist's approaches. Multiple techniques were used like LSVT, Thera-cycle which are more effective in maintaining the patient condition to improve their physical programme performance by increasing the ROM and subside the cardinal features of the disease. Flexibility of the musculoskeletal system can be maintained by encouraging the patient to lead an active life. Passive exercises may be helpful in maintaining or increasing flexibility. Functional training activities also an effective intervention to improve strength. Patient gradually develops significant physical problems. Mobility and balance can be improved with a physiotherapy intervention improvement reported in one test mobility (the timed up and go test), which times how long it takes a person to get up from a chair, walk a certain distance, then walk back to the chair and sit down) and in two test of balance (one assessing how far a person can reach before he/she loses balance (functional reach test) and another assessing multiple aspect of balance (BERG BALANCE SCALE). Disease rating scales like HOEHN AND YAHR SCALE and UPRDS SCALE can also be improved with physiotherapy intervention techniques.

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