



## Physiotherapy management of post-COVID-19 peripheral neuropathy with functional deconditioning: A case study

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### Abstract

**Background:** Post-COVID-19 syndrome is increasingly associated with neurological complications, including peripheral neuropathy and functional deconditioning, leading to persistent disability.

**Case Presentation:** A 45-year-old female presented with sensory disturbances, muscle weakness, balance impairment, and reduced functional capacity following recovery from moderate COVID-19 infection.

**Intervention:** An individualized, phase-wise physiotherapy program emphasizing sensory re-education, progressive strengthening, balance training, and aerobic conditioning was administered over 8 weeks.

**Outcome Measures:** Numeric Pain Rating Scale, Functional Independence Measure, Berg Balance Scale, and Manual Muscle Testing were used.

**Results:** Substantial improvement was observed in pain, balance, muscle strength, and functional independence.

**Conclusion:** Structured physiotherapy intervention plays a critical role in restoring function in patients with post-COVID-19 peripheral neuropathy and deconditioning.

**Keywords:** Post-COVID-19 syndrome, peripheral neuropathy, physiotherapy rehabilitation, functional deconditioning, balance training, sensory re-education

### Introduction

Coronavirus disease 2019 (COVID-19), caused by the SARS-CoV-2 virus, has resulted in a broad spectrum of acute and long-term complications affecting multiple organ systems. Beyond respiratory involvement, neurological manifestations have gained increasing attention due to their prevalence and long-term impact on functional outcomes<sup>[1]</sup>. Post-acute sequelae of COVID-19 (PASC), commonly referred to as “long COVID,” include fatigue, myalgia, cognitive dysfunction, autonomic disturbances, and peripheral neuropathy<sup>[2]</sup>.

Peripheral neuropathy following COVID-19 infection is characterized by sensory symptoms such as paresthesia, numbness, burning pain, and motor weakness, predominantly affecting distal extremities<sup>3</sup>. Proposed mechanisms include immune-mediated nerve injury, cytokine-induced inflammation, microvascular ischemia, and prolonged hypoxia<sup>[4]</sup>. Even patients with moderate infection and no intensive care admission may develop persistent neurological deficits.

Functional deconditioning is another significant consequence of COVID-19, resulting from prolonged inactivity, social isolation, fatigue, and reduced physical capacity<sup>5</sup>. Deconditioning further exacerbates neuromuscular weakness, balance impairment, and reduced endurance, increasing fall risk and limiting participation in daily activities.

Physiotherapy plays a vital role in addressing both neurological impairments and functional decline through targeted sensory re-education, strength training, balance retraining, and aerobic conditioning<sup>[6]</sup>. Although rehabilitation guidelines for post-COVID-19 care are evolving, there is limited published literature describing structured physiotherapy management of post-COVID-19 peripheral neuropathy. This case study aims to highlight the

clinical reasoning, intervention strategy, and outcomes of physiotherapy rehabilitation in such a patient.

### Methodology

#### Study Design

This is a single-patient descriptive case study, prepared according to CARE (CAse REport) guidelines for clinical case reporting.

#### Patient Information

- **Age:** 45 years
- **Gender:** Female
- **Occupation:** School teacher
- **Hand dominance:** Right
- **Residence:** Urban India

#### Medical History

The patient tested positive for COVID-19 via RT-PCR three months prior to presentation. She experienced moderate symptoms including fever, cough, body aches, and fatigue, and was managed conservatively at home. She did not require oxygen therapy, ICU admission, or mechanical ventilation. No pre-existing neurological, metabolic, or musculoskeletal disorders were reported.

#### Presenting Complaints

- Persistent tingling and numbness in both hands and feet
- Generalized muscle weakness
- Easy fatigability
- Difficulty maintaining balance while walking
- Reduced tolerance to prolonged standing

Symptoms persisted for more than six weeks after recovery from the acute infection.

**Clinical Examination**

**Sensory Assessment**

- Reduced light touch and vibration sensation in bilateral distal lower limbs
- Impaired proprioception at ankle joints

**Motor Assessment**

**Manual Muscle Testing**

- Proximal lower limb muscles: 4/5
- Distal lower limb muscles: 3+/5

**Balance and Gait**

- Positive Romberg test
- Widened base of support during gait
- Reduced gait speed

**Outcome Measures**

Validated outcome measures were selected to quantify impairment and functional limitation

Measure	Description
Numeric Pain Rating Scale (NPRS)	Pain intensity
Functional Independence Measure (FIM)	Functional ability
Berg Balance Scale (BBS)	Balance and fall risk
Manual Muscle Testing (MMT)	Muscle strength

Assessments were performed at baseline and after 8 weeks of intervention.

**Physiotherapy Intervention**

The patient underwent 8 weeks of supervised physiotherapy, 5 sessions per week, each session lasting approximately 60 minutes.

**Phase 1: Sensory Re-education and Activation (Week 1–2)**

- Tactile stimulation using varied textures
- Joint position sense training
- Active-assisted exercises
- Breathing and relaxation exercises

**Phase 2: Strength and Balance Training (Week 3–5)**

- Progressive resistance exercises
- Static and dynamic balance exercises
- Weight-shifting and postural control activities
- Gait training with verbal and visual feedback

**Phase 3: Functional and Endurance Training (Week 6–8)**

- Aerobic conditioning (treadmill walking, stationary cycling)
- Functional task-oriented training
- Dual-task balance exercises
- Home exercise program with progression

**Results**

Outcome Measure	Pre-intervention	Post-intervention
NPRS	6/10	1/10
FIM	96/126	118/126
Berg Balance Scale	38/56	52/56
Distal Muscle Strength	3+/5	4+/5

The patient demonstrated marked improvement in sensory symptoms, balance confidence, endurance, and independence in daily activities.

**Discussion**

This case study demonstrates the effectiveness of a structured, individualized physiotherapy program in managing post-COVID-19 peripheral neuropathy with functional deconditioning. The neurological manifestations observed in this patient are consistent with emerging literature identifying peripheral nerve involvement as a component of post-COVID-19 syndrome [1, 3].

Sensory re-education strategies were incorporated early to enhance afferent input and promote neuroplasticity. Progressive strengthening and balance training addressed neuromuscular weakness and postural instability, which are common contributors to fall risk in post-viral neuropathy [7]. Improvements in Berg Balance Scale scores reflect enhanced postural control and functional stability.

Functional and endurance training were essential to counteract deconditioning, improve cardiovascular tolerance, and facilitate reintegration into daily and occupational activities. Similar rehabilitation approaches have been recommended in consensus statements on post-COVID-19 rehabilitation [6, 8].

The substantial improvement in Functional Independence Measure scores highlights the role of physiotherapy in restoring participation and quality of life. This case supports the need for early screening of neurological symptoms and timely referral for rehabilitation in post-COVID-19 patients.

**Conclusion**

Post-COVID-19 peripheral neuropathy with functional deconditioning can result in significant disability. A comprehensive, phase-wise physiotherapy program focusing on sensory re-education, strengthening, balance, and endurance training can lead to meaningful functional recovery. Physiotherapy should be an integral component of post-COVID-19 rehabilitation care.

**Patient Consent**

Written informed consent was obtained from the patient prior to publication.

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