

Rehabilitation of A Patient Diagnosed with Polymyositis Following COVID-19 Vaccination: A Case Report

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How to cite this article: Dhruti Patel. Rehabilitation of A Patient Diagnosed with Polymyositis Following COVID-19 Vaccination: A Case Report. Indian Journal of Physiotherapy and Occupational Therapy / Vol 19 No. 4, October - December 2025

Abstract

Polymyositis (PM) is one of four types of rare inflammatory myopathies. The occurrence of myositis induced by COVID-19 vaccination is an uncommon phenomenon, and there is uncertainty whether such cases would respond to conventional physical therapy treatments typically administered to patients with polymyositis. This study is a single case report that aims to outline the physical therapy plan of care for a patient diagnosed with PM following COVID-19 vaccination. A woman in her 30s was admitted to home health physical therapy more than a year after being diagnosed with PM. She complained of 4/10 dull-aching pain in the lumbo-pelvic area, and functional deficits included inability to rise to standing from a sitting position, roll in bed, reach overhead, walk without assistance and negotiate a flight of stairs. The patient was assessed with the SF-36 questionnaire, TUG, 2MWT, standing balance and muscle strength testing. She participated in physical therapy treatment for 10 weeks. The patient demonstrated improvement of overall functional mobility. TUG improved from 29 to 23 seconds, and 2MWT increased from 50 to 96 meters. Pain decreased from 4/10 to 2-3/10. This case report provides one example of physical therapy interventions for the rehabilitation of Covid vaccine induced PM. Results suggest physical therapy interventions may improve functional mobility, even in this condition.

Keywords: Covid-19, myositis, TUG

Introduction

Idiopathic inflammatory myopathies are rare, systemic and acquired diseases that are classified into 4 sub-types: dermatomyositis, polymyositis, immune-mediated necrotizing myopathies, and sporadic inclusion body myositis¹. PM is more prevalent in women than in men². It rarely presents in childhood and usually affects people above the age of 20 years. The exact cause of polymyositis is unknown³. PM resembles an autoimmune disorder where the body attacks its own tissues. Associated conditions include Raynaud's disease, connective tissue disorders such as lupus, rheumatoid arthritis, scleroderma, and Sjogren's syndrome. Cardiovascular

diseases such as myocarditis, congestive heart failure, arrhythmias, and lung diseases such as fibrosis are also commonly related. It is thought to be triggered by environmental factors in genetically predisposed individuals. Other suspected triggers include long term use of drugs such as hydralazine, procainamide, viral infections such as human immune-deficiency virus, Coxsackievirus and Hepatitis C virus; and malignancies. Vaccines, which elicit an immune response in individuals have also been considered as potential triggers for autoimmune conditions⁴.

The main characteristic of PM is weakness in the proximal muscles of the hips, thighs, trunk, shoulders, and neck, along with joint stiffness and

myalgia. It may progress to affect the respiratory, speech, and swallowing muscles, causing dysphagia, breathing difficulties, or pneumonia⁵. Common medications used to treat PM include corticosteroids like prednisone, corticosteroid-sparing agents such as azathioprine and methotrexate, intravenous immunoglobulins, and Rituximab⁶.

The Covid-19 pandemic, caused by the novel coronavirus SARS-CoV-2 has had a profound impact on global public health. In 2020, vaccines developed by Pfizer-BioNTech, Moderna, and AstraZeneca were distributed globally to combat the infection. Auto-immune diseases post vaccination can be overlooked as potential contributors to the clinical manifestation of myositis⁷. Covid-19 vaccine-induced myositis represents an uncommon phenomenon⁸. It is uncertain whether it would respond to traditional physical therapy care in a manner provided to patients with polymyositis.

The primary objectives in managing PM are to reduce inflammation, restore muscle function, and prevent the progression of chronic muscle disease to enhance quality of life. Physical therapy intervention has been shown to improve muscle strength and quality of life in patients with PM⁹. A study conducted by H. Alexanderson et al¹⁰ showed that resistance training improved muscle performance and aerobic capacity in adult patients with active PM. Varjú et al¹¹ examined the effects of physical exercise in patients with acute and chronic PM and showed improved muscle strength and respiratory function in both groups.

The purpose of this case report is to describe the physical therapy plan of care for a patient diagnosed with PM after receiving the Covid-19 vaccination.

Materials and Methodology

A female patient in her 30s was admitted to home health physical therapy more than a year after being diagnosed with PM. It is unknown why she did not receive physiotherapy care soon after experiencing the symptoms. Her symptoms started as generalized muscle pain and stiffness during the early morning hours, a few weeks after having received the dose of Covid-19 vaccine. The myalgias increased in duration

and frequency and within a few months she was experiencing exhaustion requiring extensive help in all the activities of daily living. She complained of 4/10 dull-aching pain on the numerical rating scale in the lumbo-pelvic area, was unable to rise to standing from a low-sitting position, roll in bed, reach overhead, walk without the use of assistive device, and negotiate a flight of stairs. She was prescribed corticosteroids and medications for pain relief. The patient had an unremarkable medical history and no family history of autoimmune disorders. Prior to this, the patient was active and employed full-time. Laboratory tests and a muscle biopsy confirmed the diagnosis of PM. The development of symptoms post-vaccination and the confirming tests suggested Covid-19 induced polymyositis.

At the time of evaluation, her vitals were, blood pressure 134/76, pulse 81, temperature 97.9°F and oxygen saturation 100%. There was no peripheral joint swelling or nodules within the upper and lower extremity muscles and joints upon palpation. A visual inspection of the skin revealed no discoloration, rashes or lesions. Sensations for light touch and pressure were intact in bilateral upper and lower extremities. Proprioception was intact in bilateral hip, knee, ankle, inter-phalangeal joints of great toe, shoulder, elbow and wrist joints. She experienced mild dysphagia at times but denied coughing, wheezing or trouble breathing. Active range of motion was moderately limited in all shoulder motions, elbow flexion and extension and severely limited in all hip motions, knee flexion and extension and ankle dorsiflexion.

The patient required contact guard assist for sit to stand transfers and minimum assist of one for bed mobility transfers. She was able to ambulate for 65 feet on a level surface with a rolling walker with stand-by assistance before needing to sit due to muscle fatigue. The patient ambulated with a backward trunk lean and a waddling gait. She displayed poor cadence and increased double support time. She displayed a slightly stooped posture in sitting. In standing, she presented with sway-back posture and an anterior pelvic tilt. Muscle strength was assessed using MMT for musculature. The patient's strength limitations are noted in Table 1.

Table 1. Manual Muscle Test grades for upper and lower extremity musculature

Muscle group	Right Initial Evaluation	Left initial Evaluation	Right final Evaluation	Left final Evaluation
Hip Flexion	2+/5	3-/5	3/5	3+/5
Hip Extension	2+/5	3/5	3/5	3+/5
Hip adduction	3-/5	3/5	3/5	3+/5
Hip abduction	2/5	3-/5	3/5	3+/5
Knee flexion	3/5	3+/5	3+/5	4/5
Knee extension	3-/5	3+/5	3+/5	4/5
Ankle plantarflexion	3+/5	4-/5	4-/5	4/5
Ankle dorsiflexion	3-/5	3+/5	3/5	4/5
Shoulder flexion	3-/5	3-/5	3+/5	3+/5
Shoulder extension	2+/5	2/5	3-/5	3/5
Shoulder abduction	2+/5	2+/5	3+/5	4-/5
Elbow flexion	3+/5	3+/5	4/5	4/5
Elbow extension	3+/5	3/5	4-/5	4/5
Forearm supination	3/5	3/5	3+/5	3+/5
Forearm pronation	3+/5	3+/5	4/5	4-/5

Active range of motion was moderately limited in all shoulder motions, elbow flexion and extension and severely limited in all hip motions, knee flexion and extension and ankle dorsiflexion. PROM was grossly within functional limits.

The SF-36 questionnaire (SF-36) is a measure of quality of life. It is self-reported and consists of 36 questions that cover 8 domains of health¹²The International Myositis Assessment and Clinical Studies Group has recommended the use of the SF-36 to assess health related quality of life¹³. The patient scored on physical functioning 10/100, on role limitations due to physical health 0/100, on role limitations due to emotional problems 0/100, on fatigue 15/100, on emotional well-being 36/100, on social functioning 25/100, on pain 55/100, on general health 30/100. The mean score is 50 for each domain. Scores higher than the mean indicate better health and functioning while lower scores indicate poor health.

The Timed Up and Go test (TUG) was used to measure functional mobility¹⁴. This test was adapted

by Podsiadlo and Richardson from Mathias et al¹⁵and is used to test basic mobility and fall risk in community dwelling adults between 60-90 years of age. The patient scored 29 seconds.

The two-minute walk test (2-MWT) was used to assess endurance and walking ability. It was used over the standard 6-minute walk test due to the cardiopulmonary demands to ambulate for the duration of the test. The patient ambulated for 50 meters in 2 minutes using a rolling walker.

Standing static balance was evaluated using the 4-stage balance test. The patient exhibited difficulty maintaining her position in tandem stance for a duration of 10 seconds, and was unable to stand on a single leg. Static sitting balance was good. The patient was able to sit with an upright posture without loss of balance against moderate resistance. Dynamic sitting balance, although not specifically tested with perturbations, appeared diminished. The patient exhibited impaired weight shifting bilaterally during movement and required upper extremity support to cross midline.

The patient presented with exam findings of proximal muscle weakness, trunk weakness, deconditioning, impaired static and dynamic balance and impaired active range of motion due to vaccine induced PM, resulting in difficulty with ADLs and grooming, difficulty with ambulation and transfers and impaired tolerance to activity due to fatigue. These limitations were limiting the patient to participate in community and leisure activities, function independently in her home and return to her work duties due to her impaired strength and endurance.

Intervention

The patient received physical therapy treatment twice per week for 10 weeks for 60-minute sessions.

Two additional sessions were conducted which consisted of the initial evaluation and a discharge visit. PT interventions consisted of therapeutic exercise to improve strength and mobility, gait and balance training, and endurance exercises. A written home exercise program was established in each visit for the patient to continue exercises on non-therapy days. Strength-resistance training targeting both upper and lower extremity musculature was performed. 10-repetition maximum rule was utilized for progression to increase weights. Strengthening exercises for the core and back musculature were also incorporated to address impaired posture and add stability during functional mobility (Table 3).

Table 3. Strengthening exercises for upper and lower extremity musculature. BW=body weight, TB=TheraBand, AAROM=active assisted range of motion, AROM=active range of motion

Exercise	Weight/resistance	Progression	
		Initial resistance level	Final resistance level at discharge
Seated long-arc quad	BW/ 1lb, 2lbs ankle weights	1lb ankle weight	2 lbs. ankle weights
Seated hip flexion	BW/ 1lb, 2lbs, 2.5lbs ankle weights	1lb ankle weight	2.5 lbs. ankle weights
Seated hip abduction	BW/ 1lb, 2lbs, 2.5lbs ankle weights	1lb ankle weight	2.5 lbs. ankle weights
Standing hip flexion, extension, abduction	BW/ 1lb, 2lbs, 2.5lbs ankle weights	1lb ankle weight	2.5 lbs. ankle weights
Supine hip abduction, adduction	BW/1lb, 1.5lbs ankle weights	1lb ankle weight	1.5 lbs. ankle weights
Supine hip flexion	BW/ 1lb ankle weight	Minimal assistance by therapist to complete the activity	1lb ankle weight
Seated hamstring curls	Orange/green/blue TB	Orange TB	Blue TB
Seated ankle plantar/dorsi-flexion	Yellow/orange/green TB	Yellow TB	Green TB
Supine heel slides	BW/ Yellow/ Orange/green TB	Yellow TB	Green TB
Seated bicep curls	2lbs, 4lbs dumbbells	2lbs dumbbells	4lbs dumbbells
Seated shoulder flexion, abduction	1lb, 2lbs dumbbells	1lbs dumbbells	2lbs dumbbells
Chest press	Orange/green/blue TB	Orange TB	Blue TB
Chest pulls	Yellow/orange/green TB	Yellow TB	Green TB

Continue....

Upright row	Yellow/orange/green TB	Yellow TB	Green TB
Overhead press	Yellow/orange/green TB	Yellow TB	Green TB
Core and Back strengthening			
Sitting back extension	Manual resistance	Minimal resistance	Moderate-Maximum resistance
Supine isometric abdominals	BW	5-sec hold time	20-sec hold time
Bridging	BW	AAROM	Bridging with pillow in between, single leg bridging
Half-abdominal crunch	BW	Neck off/upper scapula off surface	Scapula off the surface
Trunk rotation	BW	AAROM	AROM
Pelvic tilts	BW	10 reps/set, 1 set	10 reps/set, 3sets
Pelvic tilts with knee fall-outs	BW	AAROM	AROM with isometric control
Mini-squats/ Squats	BW	10 reps/set, 1 set	15 reps/set, 3 sets

Ambulation was performed using a front wheeled walker and stand-by assistance from the therapist. Gait training doubled as a functional endurance exercise. Depending on the patient's tolerance, ambulation distance was gradually increased in each visit and obstacle negotiation was implemented.

Therapeutic activity, focusing on functional balance training, was introduced in the third week of the plan of care. Therapeutic activities included stepping exercises to the side, and backwards, standing on 1 to 3" foam pads and on a 6- inch step while incorporating reaching in all directions. The patient required the support of a front wheeled walker as well as assistance of her spouse and the therapist for these functional activities.

Result

Throughout the plan of care, the patient showed gains in her strength and endurance. She demonstrated improvement in bed mobility and was able to roll independently in bed. However, she still required minimal to contact guard assistance for supine to sit transfers in bed. She was able to rise from a chair and perform bed to chair transfers using the rolling walker independently. Although she ambulated with

a slow gait and increased double support time, the patient showed improvement in her endurance and ability to ambulate up to 180 ft before needing to sit down to rest. The patient continued to have episodes of loss of balance while ambulating therefore it was decided that she would continue to use her rolling walker for ambulation. She was able to negotiate a flight of 12 steps using 1 handrail independently.

The TUG which was originally validated in older adults has a sensitivity of 80% to predict falls with a cut-off score of greater than 13.5 seconds and specificity of 100%¹⁶. Although it is not tested in 30-year-old patients or in PM, it is a valuable tool for mobility assessment and to predict risk for falls. The patient's score of 29 seconds was above the normative value of 8.56 seconds in 30-year-old individuals indicating reduced physical capacity¹⁷. Upon discharge, the patient had a moderate improvement with a score of 23 seconds. Additionally, the patient showed greater improvement in the 2-MWT. She was able to ambulate for 96meters at the time of discharge. Despite not being directly addressed using modalities, the patient showed a reduction in her self-reported pain score.

For the SF-36 questionnaire, upon final evaluation the patient showed gains in all the domains; on physical functioning 55/100, on role limitations due to physical health 75/100, on role limitations due to emotional problems 100/100, on fatigue 55/100, on emotional well-being 84/100, on social functioning 75/100, on pain 90/100, on general health 50/100.

Additional details of patient's outcomes are listed in Table 2.

Table 2. Outcomes measures

Outcome	Initial evaluation	Discharge
TUG	29 seconds	23 seconds
2-MWT	50 meters	96 meters
Single leg stance	Unable to maintain position	Unable to maintain position
Pain	4/10	2-3/10

Discussion

The goal of this study was to describe physical therapy management of an otherwise healthy patient diagnosed with polymyositis after vaccination. The therapeutic approach yielded notable improvements in the patient's functional capacity and quality of life. The patient demonstrated improvement in lower extremity strength and endurance. Additionally, the patient's upper extremity function improved as well. The patient was able to engage more independently in the activities of daily living (ADLs), such as grooming, dressing and other self-care abilities. She reported an improved tolerance for community mobility with assistance from her husband. These outcomes are consistent with physical therapy's role in the treatment of PM, as it is recognized as a crucial intervention for restoring muscle strength and function.¹⁸ With increased independence, she had an improved perception of emotional well-being as seen on the SF-36 scores. It can be concluded that physical therapy management is safe and effective in a case such as this.

There were limitations to this case report, mainly the patient had marginal increase in the 2-MWT and the TUG. The patient ambulated for 96 m using the

rolling walker for 2-MWT which was greater than the distance ambulated during initial evaluation. It was however, still below the mean distance of 183m calculated for women in the same age group¹⁹. The difference was still slightly greater than 33.4 meters which is the minimal detectable change required for clinical improvement. The patient continued to have balance impairments as evidenced on the balance test. 4-stage balance test has a specificity of 76% and the patient was unable to maintain single-leg stance for a duration of 5 seconds indicative of increased risk for falls²⁰. The patient did improve by a marginal score of 6 seconds in the TUG test. It is considered a valid tool for predicting risk for falls when combined with other balance measures. Results of the TUG and 4-stage balance test put the patient at risk for falls.

Interventions consisting of targeted strength and balance exercises and incorporating pain management strategies could have been used to improve the outcome. Additionally, stressing the importance of adherence to the exercise program in a home-health setting would have been beneficial. Another limitation was the lack of inter-disciplinary approach to the care of the patient. She could have benefitted from respiratory therapy management to improve the function of respiratory musculature as these are commonly affected with PM. Additionally, referral for dietician interventions could have assisted the patient with improving her general well-being.

Several studies have shown the importance of early diagnosis and management of PM. A study done by Malik, et al¹ focused on a tailored clinical approach with the use of corticosteroids and immunotherapy for disease control. In terms of rehabilitation, a systematic review done by Corrado, et al⁹ stressed the importance of supervised physiotherapy to improve functional mobility in patients with PM. This was also supported by a study done by Alexanderson, et al¹⁰ in which home based exercise programs improved functional ability in patients with PM.

Vaccines are a boon to humanity with some of them being able to eradicate diseases completely but they have also been identified as a potential trigger for autoimmune and inflammatory responses,

including myositis. Orbach and Tanay⁴ noted that vaccines, particularly the flu vaccine, have been associated with the onset of myositis in susceptible individuals. Covid-19 vaccination has seen a moderate increase in number of inflammatory myopathies²¹. More recently, Jara et al.⁷ reviewed autoimmune syndromes following COVID-19 vaccination, with some cases reporting inflammatory myopathies, such as polymyositis. This aligns with the observations in the present study, which found a temporal link between COVID-19 vaccination and the onset of myositis in a subset of patients. A study by Vojdani and Kharratian²² mentioned the possibility of an auto-immune reaction due to the similar structural properties between spike protein in a vaccine and the host protein. It is important for clinicians to take that into consideration when encountering a patient with clinical symptoms of polymyositis post vaccination for a viral disease.

Conclusion

This case report highlights the value of appropriately directed physical therapy care for a patient with vaccine induced PM. It is important for all patients to have a plan of care that's unique to them and their functional needs and goals. This case report also emphasizes the importance of additional research for physical therapy protocols for vaccine induced polymyositis. Future investigations should also aim to evaluate the long-term effects of physical therapy interventions in this patient population.

Conflict of Interest: None

Source of Funding: Self

Ethical Clearance. This case report was reviewed under the MedStar Health Research Institute (MHRI) guidelines and was determined not to constitute human subject's research. According to the August 1, 2017 memo from the MHRI Office of Research Integrity, case reports involving fewer than three patients do not meet the Department of Health and Human Services (DHHS) or Food and Drug Administration (FDA) definitions of research and are therefore exempt from Institutional Review Board (IRB) review and approval. The report was

prepared in compliance with HIPAA guidelines. No identifiable patient information is included, and IRB exemption applies per MedStar policy.

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