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Case Report

Physiotherapy results of a patient with critical illness polyneuropathy due to COVID-19: A case report

A case report of the patient with Covid-19 applied physiotherapy

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Abstract
The aim of this study is to examine the results of physiotherapy in a patient with critical illness polyneuropathy (CIP) due to coronavirus disease 2019 (COVID-19). The 48-year-old male patient with CIP due to COVID-19 was enrolled in a physiotherapy program for 3 months with 5 sessions/week. Pain intensity, motor skills, daily living activities, fatigue level, cognitive status, and decubitus ulcer were evaluated with a visual analogue scale, the Medical Research Council-Sum Score, the Functional Independence Scale, the Fatigue Severity Scale, the Standardized Mini-Mental Test, and pressure wound staging, respectively. Positive improvements were achieved in functional level, fatigue, pain, and pressure sores with the physiotherapy program for this patient with CIP due to COVID-19. This report provides an idea about the effects of physiotherapy programs for COVID-19-related CIP to academics and clinicians working in this field.

Keywords
COVID-19, Polyneuropathy, Neurological Physiotherapy, Critical Illness, Case Reports

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Introduction

Neurological manifestations of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) are increasingly recognized as a major complication with potential long-term consequences for both patients and the healthcare system. One study reported that approximately 36% of confirmed coronavirus disease 2019 (COVID-19) cases involved neurological symptoms. Patients with severe COVID-19 infections are at risk of developing neurological diseases such as stroke, multiple sclerosis, polyneuropathy, and encephalitis [1].

COVID-19-related polyneuropathy, also called critical illness polyneuropathy (CIP), is characterized by bilateral muscle weakness, sensory impairment, and decreased deep tendon reflexes. Nerve conduction studies have also indicated temporarily reduced compound muscle action potential amplitudes, prolonged distal motor latency, conduction block, or temporal dispersion in patients with CIP [2].

Physical therapy approaches are important in terms of reducing the respiratory problems, addressing the effects of extended immobilization, and treating the neurological complications that may occur during and after COVID-19. The present report is important in terms of sharing the symptoms and physiotherapy results of a patient who developed polyneuropathy related to COVID-19 with clinicians and academics interested in this field. The aim of this paper is to examine the symptoms and physiotherapy results of this case of polyneuropathy due to COVID-19.

Case Report

A 48-year-old male patient with CIP due to COVID-19 is presented in this study. The patient was enrolled in the physiotherapy and rehabilitation program of the Pamukkale University Neurological Rehabilitation Unit between May and August 2020. He was informed about the case report verbally and in writing and he provided informed consent.

The patient was evaluated before the rehabilitation program and at 1 month and 3 months after the first evaluation. The type of pain, use of analgesics, and localization were recorded. The severity of pain was determined with a visual analogue scale (VAS). Deep tendon reflexes and muscle tone were evaluated. The Medical Research Council-Sum Score (MRC-SS) was used to assess motor skills, the Functional Independence Measure (FIM) was used for daily living activities, the Fatigue Severity Scale (FSS) was used for fatigue level, and the Standardized Mini-Mental Test (SMMT) was used for cognitive status. A decubitus ulcer in the sacral region was assessed by pressure wound staging. Electromyography (EMG) findings for the diagnosis of CIP were recorded.

The VAS allows for a subjective assessment of pain. The patient marked the severity of his pain on a 10-cm VAS. The scale was scored between 0 and 10, from 0 = no pain to 10 = worst pain.

The MRC-SS is a motor evaluation used in cases of polyneuropathies and muscular dystrophies. Six muscle groups were evaluated bilaterally, including shoulder abductors, elbow flexors, wrist extensors, hip flexors, knee extensors, and ankle dorsiflexors. Each muscle group was assessed from 0 = paralysis to 5 = normal strength [3].

The FIM consists of six parts that measure physical and cognitive inadequacies, need for help, and care burden in daily living activities. These six parts include the functions of self-care, sphincter control, mobility, movement, communication, and social cognition, with a total of 18 items. Each item is assessed on a 7-point Likert scale that indicates the amount of assistance required (1 = total assistance, 7 = total independence) [4].

The FSS is a 9-item scale that measures the severity of fatigue and its effects on daily living activities from the patient's own perspective. Each item of the scale is scored between 0 and 7 (0 = strongly disagree, 7 = strongly agree). The total score is calculated by dividing the score by 7 [5].

The SMMT includes the five main domains of orientation (10 points), registration (3 points), attention (5 points), recall (3 points), and language (9 points). It contains 11 items. The total score range is 0-30 points. Cut-off scores are considered as follows: 27-30: within normal limits; 24-27: mild cognitive impairment; fewer than 24 points: severe cognitive impairment [6].

The Classification of Pressure Ulcers is one of the most commonly used standardized classification systems for pressure injuries and is recommended by the National Pressure Ulcers Panel [7]. It consists of 4 stages. In stage 1, there is a rash that does not fade on the skin, while the integrity of the skin is preserved. In stage 4, full-thickness skin loss with advanced tissue damage and necrosis indicates the destruction of muscle, bone, or connective tissues.

The physiotherapy and rehabilitation program was applied for the patient for 3 months, with sessions conducted 5 days/week and 1 hour/day. The rehabilitation program included calisthenic exercises, strengthening exercises, sensory training, proprioceptive neuromuscular facilitation techniques, breathing exercises, gait training, wrist stabilization, and grip-release training. A static hand-wrist splint and a bilateral foot-ankle splint were also recommended. The patient used his orthoses at night and rest. A dorsiflexion band was recommended bilaterally for ambulation. The use and care of the orthoses were taught to both the patient and his wife. The rehabilitation program was also taught to the patient and his wife before he was discharged.

The patient had been diagnosed with COVID-19 on March 15, 2020. After 3 days of follow-up in the service, he was moved to the intensive care unit on March 18, 2020 and intubated. He was returned to the service from the intensive care unit on May 29, 2020. The bilateral sural nerve, right tibial motor nerve, and left fibular motor nerve could not be stimulated in the EMG evaluation performed on June 2, 2020. The right ulnar motor nerve compound muscle action potential amplitude was low. As a result, the data were compatible with sensorimotor polyneuropathy. The patient was enrolled in the rehabilitation program between May and August 2020.

He had no history of chronic disease or smoking. He had a stage 4 decubitus ulcer in the sacral region 5 × 7 cm in size according to the Classification of Pressure Ulcers before treatment. After treatment, the decubitus ulcer was evaluated as stage 3 and 3 × 4 cm. The severity of shoulder pain had decreased in both rest and activity at the end of the rehabilitation program (Table 1).

The biceps, triceps, styloradial, patellar, and Achilles reflexes

Table 1. Pain and motor assessment of the patient

VAS	Baseline		1st Month		3rd Month	
	Rest	Activity	Rest	Activity	Rest	Activity
Severity	10	10	7.1	9	1	6.5
Localization	Bilaterally Shoulder		Bilaterally Shoulder		Bilaterally Shoulder	
Type	Stinging		Stinging		Stinging	
Using Medicine	+		+		-	
MRC-SS	Strength		Strength		Strength	
Muscles	Right	Left	Right	Left	Right	Left
M. Deltoideus	2	3	2	4	4	5
M. Biceps Brachii	4	4	4	4	4	5
Wrist Extensors	0	3	1	3	2	5
M. Iliopsoas	2	2	2	4	5	5
M. Quadriceps Femoris	2	2	2	3	3	4
M. Tibialis Anterior	0	0	0	1	1	1
TOTAL SCORE	24		30		44	

VAS: Visual analogue scale; MRC-SS: Medical Research Council-Sum Score.

Table 2. Daily living activities, fatigue, and cognitive assessments of the patient

Outcome Measurements	Baseline	1st Month**	3rd Month***
FIM	36	54	79
FSS	7.00	6.43	3.57
SMMT	*	23	28

FIM: Functional Independence Measure; FSS: Fatigue Severity Scale; SMMT: Standardized Mini-Mental Test. *: This test could not be applied in the intensive care unit due to intubation.

decreased bilaterally. The patient had a right-handed drop hand and bilateral drop foot before treatment. At the end of the treatment, it was determined that there was an increase in the tone of the right wrist and finger extensor muscle groups and the bilateral M. tibialis anterior muscles. In addition, the strength of the affected muscles increased after treatment (Table 2).

While the patient was bedridden before treatment, he began to walk using a walker after treatment. His level of participation in daily living activities increased after treatment. A decrease in fatigue and an increase in cognitive abilities were also observed (Table 2).

Discussion

The world is still currently experiencing a pandemic of an infectious disease called COVID-19. Turkey, like all countries, has been seriously affected by the pandemic.

Cases of polyneuropathy originating from COVID-19 have been reported in the literature. We analyzed the results of a physiotherapy and rehabilitation program for our patient with CIP due to COVID-19. At the end of the 3-month follow-up, significant improvements were found in the pain, cognition, fatigue, and functional outcomes of this case.

In the literature, back and waist pains are particularly reported among COVID-19 patients [8]. Pain was detected in both shoulders in our patient, interestingly. Furthermore, the effects of the shoulder pain continued even though it decreased for up to 3 months. The VAS scores before therapy and 1 month after physical therapy decreased with medical treatment. In the evaluation at 3 months, the decrease in pain values was maintained despite the discontinuation of medication.

In the motor evaluation of the patient, muscle strength was found to have been severely affected after COVID-19. In the initial EMG values, the bilateral sural nerve, right tibial nerve, and left fibular nerve activation were lost or decreased. After 3 months of follow-up, the muscle strength of the deltoid, iliopsoas, and quadriceps femoris muscles had increased. The improvements in wrist extension and foot dorsiflexion were not at a functional level, although there was a slight increase. The literature supports increased distal involvement due to CIP in COVID-19.

Increased patient independence resulted in a significant reduction in the level of fatigue through the recovery of functions. There was a slight difference between the cognitive status results of the first month and the third month, but that value could not be measured in the intensive care unit. None of these findings were statistically significant.

Summary

The symptoms that can be seen in humans after COVID-19 and their progress are still not fully understood. We have tried to shed light on this situation by presenting a polyneuropathy condition caused by COVID-19 with routine physical therapy procedures. We encountered a situation in terms of progression similar to that generally presented in the literature. The rehabilitation of our patient is still continuing and his functional development is ongoing. Long-term follow-up results in cases of polyneuropathy due to COVID-19 will be valuable in terms of contributing to the literature. Continuing distal involvement in the patient presented here supports the finding of axonal degeneration. For all these reasons, the severity and progression of neuropathic involvement due to COVID-19 warrants further exploration. The present case report has contributed to the literature on this subject accordingly.

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Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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