

CASE STUDY

Physiotherapy In COVID-19. A Case Study of a Patient With a Long ICU Stay

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ABSTRACT

BACKGROUND: Early physiotherapy in critically ill patients is a key component to their survival and their functional recovery. Among the various professionals involved in the recovery of the patients with COVID-19, physiotherapists play a vital role in the prevention of complications and the rehabilitation of respiratory and musculoskeletal deficiencies.

OBJECTIVES: The aim of this case report is to present the clinical efficacy of physiotherapy intervention in a Covid-19 critically ill male patient with a prolonged ICU stay, since limited data are present in the literature regarding the course of recovery that these patients follow from ICU intubation until hospital discharge.

METHODS: Early physiotherapy commencement, comprising of respiratory and musculoskeletal interventions in order to prevent and address complications from prolonged immobilization and mechanical ventilation.

RESULTS: Significant clinical improvements were noted in the patient during his stay in the Covid-19 ICU. He was successfully liberated from mechanical ventilation and subsequently from tracheostomy tube. Improvements were more easily achieved once he was transferred to the High Dependence Unit.

CONCLUSION: In the current case study, physiotherapy was a vital and effective component of the therapeutic plan of a Covid-19 Patient, highlighting the need of a detailed and regular physical assessment along with a tailored rehabilitation program.

INTRODUCTION

COVID 19 virus appeared at the end of 2019 as a novel viral disease which spread worldwide and turned to a pandemic, as officially declared by WHO on 11/3/20¹. Since today more than 440 million people have been affected worldwide, and more than 6 million deaths have been officially reported. This has far exceeded the limits of all health care systems with significant socio-economic consequences, due to the long-lasting world-wide quarantine.² The rapid spread of the virus and the severity of the acute phase of the disease is a huge challenge for health systems internationally.² Patients

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with COVID 19 infection suffer from severe pneumonia, with a reported 14% incidence of ARDS complication and a 5% possibility of admission in the Intensive Care Unit (ICU).³

During their long stay and extended use of mechanical ventilation in ICU, patients experience significant complications such as muscle weakness, mobility deficits, reduced aerobic capacity and reduced overall function. These patients need intensive physical rehabilitation from the early stages of the disease.^{4,5}

HISTORY

We present the case of 75 year old male patient with COVID-19 infection, with a long stay in the ICU. The onset of symptoms (cough, fever, malaise) occurred on 13/3/20, and he was admitted to the hospital on 19/3/20. After a 4 day hospitalization he was intubated and admitted to the ICU. In total, the patient remained in the ICU for 5 months and another 2 months in the High Dependency Unit (ICU) of the hospital. His personal medical history included hypertension, atrial fibrillation, hypothyroidism, dyslipidemia, partial nephrectomy due to renal tumor and G6PD deficiency. The patient underwent a tracheostomy on 15/4/20. He was supported with hemodialysis during most of his ICU stay. His course was complicated by multiple episodes of serious infection, while hemodynamic instability due to sepsis and dysautonomy required treatment with large doses of vasoconstrictor drugs for a long period of time. The first attempt to remove the tracheostomy tube was made on 1/7/20, while the final tracheostomy closure took place on 3/9/20. The intensive physiotherapy program that was implemented included interventions for both the respiratory and musculoskeletal systems and assisted in the gradual recovery of the patient and his safe discharge from the hospital on 26/9/20.

PHYSIOTHERAPY INTERVENTION

1. ACUTE PHASE: PATIENT IN ICU UNDER MECHANICAL VENTILATION

Assessment and Respiratory Physiotherapy

During the patient's ICU stay the patient was sedated and under the use of muscle relaxant drugs. Tracheostomy was performed 22 days after his intubation. Physiotherapy assessment identified respiratory complications including acute lobar atelectasis.

At this stage the goal of physiotherapy was to:

- Prevent bronchial secretions retention
- Resolve lung atelectasis
- Improve respiratory function

During patient's weaning procedure, emphasis was placed on limiting the detrimental effects of mandatory mechanical

ventilation on respiratory muscles, as well as encouraging, assisting, and teaching the patient how to cough.

At this stage physiotherapy interventions included:

- Head tilt at 30°
- Lung postural drainage techniques to mobilize secretions
- Humidification and nebulization
- Ventilator assisted strengthening of the inspiratory muscles by reducing the support level
- Manual lung hyperventilation
- Inspiratory muscle strengthening with the threshold device (IMT).⁶

Assessment and Early Mobilization Interventions

During this phase, assessment of the peripheral joint range of motion and muscle atrophy were evaluated daily, while at intervals of sedation, muscle strength, patient's neurological status, communication level and ability to perform specific commands were also assessed.

The aims of physiotherapy at this stage were:

- To maintain joint mobility and prevent contractures, as well as muscle power in periods of reduced sedation.
- To prevent deep vein thrombosis
- To prevent and reduce oedema in the upper extremities

Physiotherapy techniques at this stage included the following:

- Positioning of the upper and lower limbs
- Passive, active and assisted exercises depending on the level of consciousness and co-operation
- Use of neuromuscular electrical stimulation (Figure 1)
- Placement of the patient in sitting position at the edge of the bed
- Sitting balance exercises.



FIGURE 1. Neuromuscular electrical stimulation.

2. SUB-ACUTE PHASE: ICU AND HIGH DEPENDENCY UNIT. NO MECHANICAL VENTILATION SUPPORT

At this stage the patient was gradually liberated from mechanical ventilation and was left to breath spontaneously with a Venturi tracheostomy oxygen mask. When the patient was admitted to the high dependency unit the tracheostomy tube was removed.

Physiotherapy assessment and respiratory physiotherapy

Assessment in this phase focused on the patient’s ability to cough effectively, while on a weekly basis an evaluation of his maximum inspiratory and expiratory pressure (MIP-MEP) was performed.

The goals of physiotherapy at this phase were:

- To prevent atelectasis
- To prevent bronchial secretion retention
- To improve cough and strengthen the respiratory muscles
- To increase the respiratory volume and aerobic capacity

Physiotherapy interventions included:

- Postural drainage to resolve atelectasis
- Chest vibrations
- Teaching and encouraging cough
- Use of inspiratory muscle strengthening device (IMT) (Figure 2)
- Use of a tri-flow breathing trainer
- Nebulization and humidification of the tracheobronchial tree.

Musculoskeletal assessment and early mobilization interventions

In this phase, active joint range of motion and muscle strength the (MRC scale) were evaluated daily (Table 1).

The goals of physiotherapy were:



FIGURE 2. Inspiratory muscle trainer of Respironics, in order to strengthen inspiratory muscles.

- To improve the active range of motion
- To increase muscle power and improve balance
- To treat the neurological complications of long-term hospitalization and bed rest such as peroneal nerve palsy (drop foot) and sensory problems
- Functional mobility and re-education

To assess and address various symptoms of mental disorders such as anxiety and depression using specific questionnaires (B.D.I.-II, I.E.S.- r)

Physiotherapy interventions included

- Implementation of a personalized program of active and resisted exercises of the upper and lower limbs and the trunk.
- Sitting balance exercises
- Balance exercises in standing position using aids (use of a walking frame)
- Gait re-education, stair climbing (application of a splint through a shoe) (figure 3)
- Upper limb functional exercises (moving objects)
- Patient education and encouragement to perform simple exercises and basic activities (eating, brushing teeth...)

MRC SCORE

TABLE 1. Muscle strength assessment at ICU and Hospital discharge

	ICU discharge		Hospital Discharge	
	Right	Left	Righte	Left
Shoulder abduction	1	1	3	3
Elbow flexion	2	1	5	4
Wrist flexion	1	1	4	4
Hip flexion	1	1	4	4
Knee extension	1	1	5	5
Plantar flexion	2	2	5	5
Total	15		51	

FOLLOW – UP

Following 6 months of hospital stay, the patient was discharged and followed a home based rehabilitation programme for 1 year. He is currently fully independent and has reached complete functional recovery and has regained his previous life status.



FIGURE 3. Ankle foot orthosis for foot drop foot and gait assistance.

DISCUSSION

Symptomatic COVID 19 virus infection is very dangerous and can lead to severe acute respiratory failure, resulting to patient intubation and admission to the ICU in order to be mechanically ventilated. Heavy sedation and use of control ventilation, along with other complications of prolonged stay in the intensive care unit are responsible for the presence of extended muscle weakness and reduced endurance.⁷ All these lead to significant reduction of functional ability and loss of independence,⁸ which delay patient recovery and point to implementation of a tailored, multidisciplinary rehabilitation program.³

This case study highlights the physiotherapeutic management of a patient who was admitted in the ICU following acute respiratory failure due to COVID 19 and had to be intubated and remain on site for several months. It is now widely accepted that early physiotherapy interventions play an important role in the recovery of the critically ill patients. After weaning the patient from mechanical support, our attention focused on the rehabilitation of the complications from the long ICU stay with the aim of his full functional recovery through an individualized program of therapeutic exercises⁹.

The successful clinical outcome of this patient case may contribute to the establishment of a structured clinical physi-

otherapy approach in the management of patients with acute respiratory failure due to COVID 19 and long ICU stay. It also clearly demonstrates the numerous complications that may occur in these patients, as well as the long recovery period, which can be minimized through early physiotherapy implementation⁹. Further research is necessary in order to investigate the role of early and follow-up physiotherapy in the long-COVID 19 complications.

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