

Physiotherapy Management of Young Male with Severe Symptoms of COVID-19 Infection: A Case Study

Gauri Wakde¹, Prajakta Patil², Sumit Jadhav³, Zahara Polen⁴,
Pranali Shamkure⁵

^{1,5}MPT Cardiovascular and Respiratory Physiotherapy, Smt. Kashibai Navale College of Physiotherapy, Narhe, Pune, India.

²Professor and HOD, Cardiovascular and Respiratory Physiotherapy, Smt. Kashibai Navale College of Physiotherapy, Narhe, Pune, India.

³Postgraduate Student, Smt. Kashibai Navale College of Physiotherapy, Narhe, Pune, India.

⁴Assistant Professor, Cardiovascular and Respiratory Physiotherapy, Smt. Kashibai Navale College of Physiotherapy, Narhe, Pune, India.

Corresponding Author: Gauri Wakde

ABSTRACT

COVID-19 is worldwide pandemic affecting every age group with symptoms ranging from asymptomatic or mild to severe respiratory failure. COVID being highly transmittable and pathogenic disease has caused huge burden worldwide for more than a year. Severe symptoms of COVID19 require immediate hospitalisation and prompt medical management. This case study illustrates the recovery of a young male patient with severe symptoms of COVID-19 with complications of ARDS and Polyneuropathy. Physiotherapy has been an integral part of multidisciplinary team in management of COVID 19 patients especially with severe respiratory illnesses. The case report mainly highlights the Physiotherapy management for the patient in camaraderie to the Medical management which resulted in remarkable recovery of the patient.

Keywords- COVID, Coronavirus, case report, case study, severe symptoms, physiotherapy, ARDS, polyneuropathy.

INTRODUCTION

Coronavirus disease 2019 (COVID19) a worldwide pandemic caused by SARS-COV2, is an unprecedented global public health crisis. First case of COVID-19 was reported on 17 November, 2019 in

Wuhan, China. ⁽¹⁾ On 30th January, the WHO declared the outbreak a Public Health Emergency of International Concern (PHEIC). ⁽²⁾

Coronavirus disease is a highly transmittable and pathogenic disease which causes rapid human to human transmission having currently 140 million cases over the globe with 14.5 million cases in India with the numbers rising rapidly.(As of 16th April 2021)

Infectious agent may transfer infection to susceptible individual directly when the person comes in contact (within 1.8meters) with an infected symptomatic or asymptomatic individual. ⁽³⁾ Direct transmission is transmitted via various routes, of which aerosols, droplets and fomites became vital routes of transmission.

⁽⁴⁾ Infected individual transfers viral particles predominantly during coughing, sneezing, talking and breathing. ⁽⁵⁾

Indirect contact with infectious secretions transferred on fomites can cause the transmission. These aerosols are active in vicinity air for 3 hours which subsequently become fomites. ⁽⁶⁾ The people confined to these surroundings are at risk of viral transmission by use of infected objects and surfaces. Virus particles remain active

on plastic for up to 2-3 days, stainless steel for up to 2-3 days, cardboard for up to 1 day, copper for up to 4 hours. ⁽⁷⁾

The incubation period for COVID 19 is 3-7 days (median 5.1 days) and up to 2 weeks as longest form of infection was 12.5/11.5 days in 97.5% of individuals. Various symptoms of COVID 19 include fever/chills (89%), cough (68%), fatigue (38%), sputum production (34%), dyspnoea (19%), muscle/ body aches, and headache, new loss of taste or smell, sore throat, congestion /runny nose, nausea /vomiting, diarrhoea. COVID-19 predominantly affects the lungs. However other body systems may also be affected causing cardiac, haematological, neurological, Gastro-intestinal, renal and liver dysfunctions. ^(8,9) Patients with comorbidities like hypertension, diabetes, obesity, cardiovascular disease, lung disease, immunocompromised diseases have risk of severe infection to COVID 19. ⁽¹⁰⁾

The radiological findings are airspace opacities, described as consolidation or ground glass opacities (GGO). The distribution is most often bilateral, peripheral, and lower zone predominant. CT Scans commonly show GGO's, crazy paving appearance, consolidation, pleural thickening, traction bronchiectasis particularly bilateral, peripheral and at bases of the lungs. ⁽¹¹⁾

The mainstay of clinical treatment consists of symptomatic management along oxygen therapy or mechanical ventilation for patients if indicated and physiotherapy.

Physiotherapy is an integral part of the multidisciplinary ICU team supporting the holistic treatment of patients and working for various aspects in COVID 19. ⁽¹²⁾ COVID 19 patients usually present with a debilitated physical condition due to fever, fatigue, myalgia which further reduces their exercise capacity. Such devitalizing conditions can also result in prolonged immobilization and subsequently indicate mechanical ventilation if the condition worsens. Patients with moderate severity of COVID 19 also may require prolong

hospitalization because of significant decrease in their activity levels. These patients are thus prone to a reduction in their muscle strength and cardiorespiratory endurance. ⁽¹³⁾ Physiotherapy in the critical phase works mainly to wean patients off ventilator, initiates early mobilization and prevents complications which gradually progresses to regaining of strength and recovery to ADLs to improve quality of life. ⁽¹⁴⁾ Physiotherapist provide respiratory care and treatment which mainly comprises of postural correction, positioning, breathing exercises, dyspnoea relieving positions, limb mobility, relaxation exercises, and ambulation of patients.

The aim of this article is to share the Physiotherapy interventions and its vital importance and benefits in the management of a critical patient with severe disease of COVID-19. The patient in this case study has a diverse presentation and showed considerable improvement in response to physiotherapeutic interventions.

CASE PRESENTATION

A 30 year old male with no known comorbidities was admitted in COVID-19 suspect ward on 14/11/2020. He had no history of contact with COVID 19 patients nor had history of travel. He came with chief complaints of breathlessness (MMRC 4), dry cough, fever, fatigue, loss of taste since 2 days.

On general examination, patient was febrile with fever of 101 F, with pulse rate 125 bpm and blood pressure 135/86 mm Hg. On auscultation, air entry was bilaterally reduced with presence of fine crackles over middle and lower zones bilaterally. Physical examination revealed tachypnoea (34 breaths/minute), nasal flaring, increased work of breathing, and use of accessory inspiratory muscles. Patient's ABG report immediately after admission revealed hypoxaemia, hypercapnia with type 1 respiratory failure and severe ARDS. ⁽¹⁵⁾ X-ray revealed overall haziness, obliteration of cardio phrenic and costo-phrenic angles and fibrotic changes. (Image 1) Chest CT

revealed subpleural thickening, GGO's, honeycombing appearances. The patient's relatives were explained about the condition and counselled.

His RT-PCR test for COVID-19 came positive on 15th November 2020 after which he was hospitalized in COVID ward in tertiary Care Hospital in Pune. At the time of admission his SPO2 was 75% on room air which improved to 89% on administering O2 (9L/min) by simple oxygen mask.

On 16th November patient had sudden drop in saturation SPO2 55%, with tachypnoea 50 bpm, tachycardia 150 bpm along with gasping and increased work of breathing. Patient was shifted to COVID-19 ICU where emergency intubation was done. Patient was kept on volume AC mode of ventilator with Fio2 of 100%.

The patient's condition continued to be stagnant and hence elective Tracheostomy was done on 1/12/2020. His RTPCR was negative on 4/12/2020. However he still required ventilator support on volume AC with 60% Fio2 hence was shifted to non COVID MICU on 5/12/2020

When the patient came to MICU he was on vol control 50% fio2, with HR 120 bpm, SPO2 90%, RR 25 bpm. While patient was on ventilator he gradually started experiencing weakness in his bilateral lower limbs. NCV examination was done on 22/12/2020 which suggested axonal sensorimotor polyneuropathy.

Since the patient started responding better and had significant improvement he was shifted to HDU on 5th January on 11L/min O2 via Non rebreathing mask. The exercises were progressed gradually to active in bed limb and breathing exercises. Subsequently patient was taken to bedside sitting whereby strengthening activities and independent sitting was focused. When patient started tolerating sitting position, progression was made to standing position. Initially there was drop in saturation from 92% to 85%, along with tachypnoea which improved when patient was given sit to stand regularly.

After a 3-4 days supported sit to stand, standing was attempted. After rigorous physiotherapy patient progressed to independent standing and spot marching. During this patient was simultaneously trained for activity pacing and ambulating 2-3 steps. The distance of ambulation was progressed gradually.

When the patient started tolerating standing position and maintaining normal vitals in standing, progression to trunk rotation, squats (5-10 repetitions) was made. Meanwhile all the previous breathing, mobility and strengthening exercises continued. As per the guidelines, drop of oxygen saturation >3 percent and/or increase in the pulse rate above 120 beats per minute was considered as terminating criteria for exercise to restore the oxygen saturation and pulse rate until the vitals stabilize. (12, 16)

Investigations performed are mentioned in (Table 1). ABG reports are presented in (Table 2)

Investigations		
Investigations	Values/ Findings	Interpretations
ECG	Heart rate-125beats per minute. PVCs present intermittently in V1, V2.	Suggestive of Right axis deviation
Haemoglobin	10	Anaemic
Ferritin	1434ng/ml	Increased
D-Dimer	13.7g/ml	Increased
Interleukin	230pg/ml	Increased
CRP (mg/l)	61.6	Increased
RFT		
Urea (mg/dl)	25	Increased
Creatinine (mg/dl)	1.9	Increased
MRI: Brain	T1/T2 Flair hyper intensity with thin peripheral hematoma, multiple microhaemorrhages in bilateral cerebral and cerebellar parenchyma.	27 th December
MRI: Lumbosacral spine	L4-L5 intervertebral disc shows diffuse disc bulge with annular tear with right paracentral protrusion indenting thecal sac and abutting bilateral traversing nerve root	27 th December
NCV	85-90meters per second	Axonal Sensorimotor Polyneuropathy 29 th December
RT-PCR (after admission)	Positive	15 th November
RT PCR (2 weeks after admission)	Negative	4 th December

Table 2

Date	15/11/2020	21/11/2020	28/11/2020	06/12/2020	15/12/2020
Day of admission	Day 2 nd	Day 8 th	Day 15 th	Day 23 rd	Day 32 nd
O2 status	9 lit via FM	MV on Vol A/C on 100% FiO2	MV on Vol A/C on 90% FiO2	MV on Vol A/C on 60% FiO2	CPAP on 60% FiO2
pH	7.33	7.30	7.40	7.426	7.435
pCO2(mmHg)	50	52.3	49.6	46.5	42.6
HCO3(mmol/L)	20	19	21.5	30.5	25.7
pO2(mmHg)	70	62.9	73.8	79.3	82.1
SPO2	89	84	89	92	94
PaO2/FiO2	100	85	130	170	230.5
Date	25/12/2020	31/12/2020	3/01/2021	08/01/2021	22/1/2021
Day of admission	Day 42 nd	Day 48 th	Day 51 st	Day 56 th	Day 70 th
O2 status	7 lit via T-piece	15L/min NRBM	11L/min NRBM	6L/min Via face mask	Room Air
pH	7.45	7.47	7.50	7.52	7.48
pCO2(mmHg)	40.6	39.4	35.7	33.4	39.3
HCO3(mmol/L)	25.6	24.1	22.7	23.1	22.4
pO2(mmHg)	73.6	79.4	83.9	89.4	90.8
SPO2	96	96	97	98	98
PaO2/FiO2	250	255.3	280	310	320

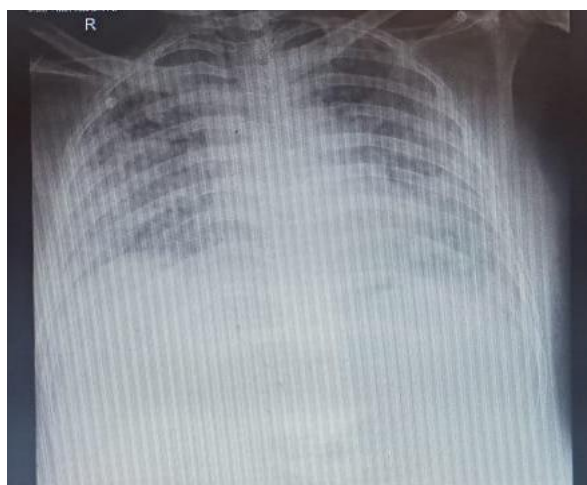


Image 1
15th November

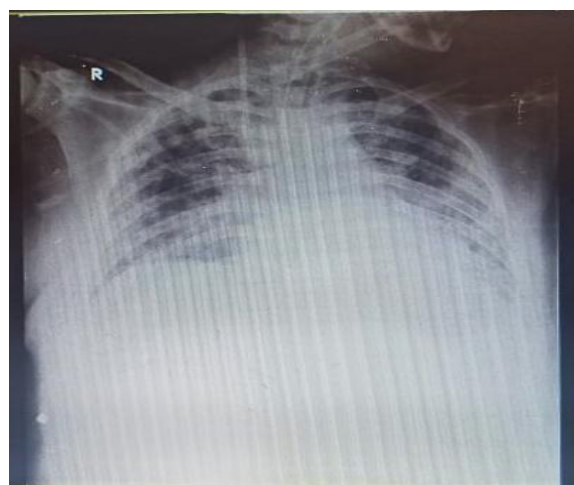


Image 2
5th December



Image 3
28th December



Image 4
18th January

DISCUSSION

COVID 19 is a worldwide pandemic which began in December 2019 in China which has now spread tremendously all over

the globe infecting the world for more than a year. Due to its massive destruction and devastation around the world, there are various treatment strategies being analysed

and implemented. Even today inspite of vaccine being available, the management mainly focuses on symptomatic treatment with root cause being untouched. Constant bombardment with news regarding rapidly increasing rate of infections and deaths every day, shortage of medications, sharing of controversial messages and videos over social media , multiple lockdown strategies have led to anxiety, panic and fear amongst common people. In spite of initiate efforts from dawn to dusk the situation has led to low faith of common people in the health care system developing social stigma and taboo against the people affected and even recovered with COVID-19. The reluctance and negligence of people to mild symptoms worsens the prognosis. The patients often report to hospitals after deterioration with severe symptoms. ⁽¹⁰⁾

The case highlights successful treatment of the patient with severe symptoms through holistic approach by medical management, Physiotherapy management, Psychological counselling along with Nutrition of the patient which led to life from death bed, from ventilator to breathing spontaneously and walking independently from paresis. Such successful treatment of the patient despite having severe symptoms helps to restore faith and instil confidence amongst common people about the health care system and encourage doctors to work more efficiently.

The patient was referred for Physiotherapy on the same day after admission. Patient was given required medications, was ventilated along with healthy nutritious diet in the hospital. Day 2 of hospitalization patient had sudden drop in saturation for which emergency intubation was done. Patient was on volume AC mode with Fio2 of 100%. The Fio2 requirements were consistent to 70-100% for around 13-15 days. During this period airway management, suctioning, positioning in lateral and propped up, chest PNF, passive/active assisted limb mobility was given. The treatment was given according to the prescribed guidelines for physiotherapy

practice in COVID 19. Patient's reference heart rate and oxygen saturation were continuously monitored during each exercise using pulse oximeter.

Subsequent ABG reports revealed improvement in PaO₂, ventilation perfusion mismatch, A/a gradient. ⁽¹⁷⁾ Patient was taken on CPAP on 15th December and gradually on T piece by 25th December.

However patient started developing weakness in bilateral lower limbs. The strength was reduced to 2+ for both the lower limbs. NCV was performed on 29th December whereby patient was diagnosed with sensorimotor polyneuropathy. Hence rigorous limb physiotherapy was started along with chest physiotherapy where active assisted movements of lower limbs, joint compression techniques, balance training along with strengthening activities were given. Exercises were progressed depending on RPE. The vitals were maintained within normal limits during the exercises with help of adequate rest intervals between exercises.

On 20th Jan 2021, significant improvement in air entry was seen bilaterally. Physiotherapy intervention along with medical management helped in improving ventilation perfusion mismatch, alveolar ventilation optimizing oxygen transport and in maintaining normal fluid distribution in the body. It also helped to prevent complications of bed rest, deconditioning and DVT. ^(18, 19) The physiotherapy management in parallel with medical management, nutritional care and counselling of the patient ensured excellent recovery, demonstrating improvement in the subsequent X-ray and ABG report, bilateral fluffy shadows seen indicative of resolving ARDS. (Image 4) NCV also showed significant improvement. The patient was able to walk independently with minimum support. The patient was able to maintain normal oxygen saturation (98%) on room air.

The patient was discharged on 25th January after all his vitals were stable and patient was able to walk independently.

Two months of rigorous team work of physiotherapy treatment along with the medical management worked fantastically for the patient, manifesting importance of

physiotherapy in COVID and also imbibed the importance of team work and boosted courage amongst all the doctors during these tough times.

Table 3- changes in vital parameters with inpatient supervised physiotherapy management

Physiotherapy treatment day	20-11-2020	21-11-2020	26-11-2020	01-12-2020	02-12-2020	08-12-2020	
O ₂ supply	MV on Vol A/C on 100% FIO ₂	MV on Vol A/C on 80% FIO ₂	MV on Vol A/C on 90% FIO ₂	Tracheostomy	Vol A/C on 60% FIO ₂	CPAP on 60% FIO ₂	
Pulse Rate	88 bpm	114bpm	100 bpm	106bpm	95 bpm	84 bpm	
SpO ₂	90%	89%	92%	90%	94%	95%	
Positioning (side lying)	Y	Y	Y	Y	Y	Y	
Prone lying	Y	Y	Y	Y	Y	Y	
Breathing Exercises						Y	
Incentive Spirometer							
In-bed Exercises						Y	
Bedside sitting exercises (without support)							
Chest PNF	Y	Y	Y	Y	Y		
Passive ROM Exs	Y	Y	Y	Y	Y		
Chest PT	Y	Y	Y	Y	Y	Y	
Active-Assisted ROM Exs					Y	Y	
Bedside sitting exercises (with support)							
Postural Correction							
Gluteal Strengthening							
Back Strengthening							
TA stretching							
VMO strengthening							
Dorsiflexors Strengthening							
Standing							
Wall Squats							
Spot Marching							
Ambulation							
Physiotherapy treatment day	15-12-2020	22-12-2020	29-12-2020	06-01-2021	13-01-2021	20-01-2021	24-01-2021
O ₂ supply	CPAP on 40% FIO ₂	T-PIECE	NRBM	NRBM	FM	Room air	Room air
Pulse Rate	76 bpm	89 bpm	112 bpm	107 bpm	99 bpm	87 bpm	85 bpm
SpO ₂	97%	98%	95%	94%	98%	95%	98%
Positioning (side lying)	Y	Y	Y	Y	Y	Y	Y
Prone lying	Y	Y	Y	Y	Y	Y	Y
Breathing Exercises	Y	Y	Y	Y	Y	Y	Y
Incentive Spirometer	Y	Y	Y	Y	Y	Y	Y
In-bed Exercises	Y	Y	Y	Y	Y	Y	Y
Bedside sitting exercises (without support)			Y	Y	Y	Y	Y
Chest PNF							
Passive ROM Exs							
Chest PT	Y	Y					
Active-Assisted ROM Exs	Y	Y					
Bedside sitting exercises (with support)		Y	Y				
Postural Correction			Y	Y	Y	Y	Y
Gluteal Strengthening			Y	Y	Y	Y	Y
Back Strengthening			Y	Y	Y	Y	Y
TA stretching			Y	Y	Y	Y	Y
VMO strengthening				Y	Y	Y	Y
Dorsiflexors Strengthening				Y	Y	Y	Y
Standing					Y	Y	Y
Wall Squats						Y	Y
Spot Marching						Y	Y
Ambulation							Y

ABBREVIATIONS-

ABG: Arterial Blood Gas
ARDS: Acute Respiratory Distress Syndrome

CARP: COVID Awake Repositioning Protocol

EMG: Electromyography
FiO₂: Fraction of Inspired Oxygen
HCO₃: Bicarbonate L/min: Litres/min

MMRC: Modified Medical Research Council

MmHg: Millimetres of mercury

Mmol/L: millimoles/Litre

NCV: Nerve conduction velocity

Pnf- Proprioceptive Neuromuscular Facilitation

PCO₂: Partial Pressure of Carbon Dioxide

PaO₂: Partial Pressure of Oxygen

RPE: Rate of Perceived Exertion

RT-PCR: Reverse Transcription Polymerase Chain Reaction

SPO₂: Saturation of Peripheral Oxygen

Acknowledgement: None

Conflict of Interest: None

Source of Funding: None

REFERENCES

1. Marco Cascella, Michael Rajnik, Arturo Cuomo et al: Features, Evaluation and Treatment Coronavirus (COVID-19). Stat Pearls; 2020
2. WHO: COVID-19 Public Health Emergency of International Concern (PHEIC).Global research and innovation forum; Feb 2020
3. Peter Thomas, Claire Baldwin, Bernie Bissett et al: Physiotherapy management for COVID-19 in the acute hospital setting: clinical practice recommendations. J Physiotherapy; 2020-66: 73-82.
4. Jayaweera,Hasini Perera Buddhika Gunawardana al: Transmission of COVID-19 virus by droplets and aerosols. A critical review on the unresolved dichotomy; 2020
5. Transmission of SARS-CoV-2: implications for infection prevention precautions. Scientific Brief; 9 July 2020
6. Nancy H Leung, Transmissibility and transmission of respiratory virus; Nature Reviews Microbiology; 2020
7. NHS: Study suggests new coronavirus may remain on surfaces for days; 2020
8. Symptoms of Coronavirus: Centres for Disease Control and Prevention, 2020
9. Shima Behzad, Leila Aghaghazvini, Amir Reza Radmard et al, Extra pulmonary manifestations of COVID19: Radiologic and clinical overview; Clin Imaging ,2020;66: 35-41.
10. Revised Guidelines on Clinical Management of COVID: Government of India Ministry of Health & Family Welfare Directorate General of Health Services (EMR Division); 2020
11. Rykiel Levine, Nicholas Caputo et al; CT scan of a COVID- positive patient, Journal of Am Physician, 2020
12. Peter Thomas, Clarie, Physiotherapy management for COVID-19 in the acute hospital setting: clinical practice recommendations. Journal of Physiotherapy; April 2020
13. Renato Fraga Righetti, Mirian Akemi Onoue et al, Physiotherapy Care of Patients with Coronavirus Disease 2019 (COVID-19) - A Brazilian Experience: Sao Paulo; June 2020
14. Chhaya V Verma, Rachna D Arora, Jaimala V Shetye et al, Guidelines of physiotherapy management in acute care of COVID-19 at dedicated COVID center in Mumbai. J Indian Assoc Physiotherapy; 2020;14:55-60.
15. Xu Li, Xiaochun Ma, Acute respiratory failure in COVID-19: is it “typical” ARDS Crit Care, 2020-24: 198.
16. Guidelines for Chest Physiotherapy management of COVID 19 in Indian Setup- MS OTPT Council; 2020.
17. Martin J Tobin, Basing respiratory management of COVID-19 on physiological principles. Am J Respir Crit Care Med; 2020: 201: 1319- 1320
18. Nim Pathmanathan, Nicola Beaumont et al, Respiratory physiotherapy in the critical care unit. Continuing Education in Anaesthesia, Critical Care & Pain, 2015; 15: 20-25.
19. Juultje Sommers, Raoul H Engelbert, Daniela Dettling et al. Physiotherapy in the intensive care unit: an evidence-based, expert driven, practical statement and rehabilitation recommendations. Clin Rehabil; 2015, 29: 1051- 1063.

How to cite this article: Wakde G, Patil P, Jadhav S et.al. Physiotherapy management of young male with severe symptoms of COVID-19 infection: a case study. *International Journal of Research and Review*. 2021; 8(4): 422-428. DOI: <https://doi.org/10.52403/ijrr.20210450>
