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Case Report

Physiotherapy Management of a Middle-Aged Adult Male with Severe Symptoms of Coronavirus Disease-19: A Case Report

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ARTICLE INFO

Article history:

Received: 20 July, 2020

Accepted: 30 July, 2020

Published: 6 August, 2020

Keywords:

Coronavirus

COVID-19

symptoms

physiotherapy

case report

ABSTRACT

Coronavirus disease-19 (COVID-19) has affected people of various age groups with symptoms ranging from asymptomatic or mild to severe respiratory failure, with mild symptoms requiring little or no medical intervention whereas severe symptoms requiring hospitalisation and prompt medical management. The following case report illustrates about recovery of a patient with severe symptoms of COVID-19 in a COVID dedicated tertiary care hospital run by the Municipal Corporation of Greater Mumbai. Physiotherapy has long been a part of multidisciplinary team in management of patients with severe respiratory illnesses. The report mainly presents about the Physiotherapy management undertaken for the above-mentioned patient parallelly to the Medical management aiding in recovery of the patient.

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Introduction

Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2) causes the novel Coronavirus disease- 2019 (COVID-19), first case of which was reported in December 2019 in Wuhan city, China. SARS-CoV-2 seems to be highly contagious as it is transmitted human to human even when the infected person is asymptomatic and thus has spread quickly all over the world [1, 2]. Person to person transmission is mainly through respiratory secretions in the form of aerosols generated during coughing, sneezing and speaking. These aerosols may remain suspended in the air upto 3 hours and inhaled by nearby person or deposit on the mucosal membranes of the eyes, or land within 2 meters and contaminate surfaces which become fomites and infect a person if the person touches his/her eyes, mouth and nose after touching such surfaces [2].

Typical presentations in individuals with COVID-19 after 2-14 days of exposure to the virus may present with variety of symptoms including

fever/chills (89%), cough (68%), fatigue (38%), sputum production (34%), dyspnea (19%), muscle/ body aches, headache, new loss of taste or smell, sore throat, congestion/runny nose, nausea/vomiting, diarrhoea. Also, there may be renal, gastrointestinal, liver, cardiac, neurological and hematological dysfunctions/abnormalities present. The severity of COVID-19 disease ranges from asymptomatic individuals and mild upper respiratory tract infection to severe viral infection causing pneumonia leading to respiratory failure and/or death [2-4]. Government of India Ministry of Health & Family Welfare Directorate General of Health Services (EMR Division): Revised Guidelines on Clinical Management of COVID-19 dated 31st March 2020 mentions an individual as a severe case who has pneumonia with hypoxaemia (SpO₂< 92%) [5].

Physiotherapy is an integral part of the ICU team supporting the holistic treatment of patients with non-invasive treatment modalities mainly involving postural changes, breathing exercises, limb mobilization, relaxation exercises, ambulation of patients and weaning off ventilator support trials [6].

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Case Presentation

A 45-year-old male, General store shopkeeper by occupation, with no known history of exposure to COVID-19 patient, came with complains of fever, breathlessness (mMRC Grade 4), dry cough, palpitations, fatigue and giddiness on standing since 2 days [7]. On general examination, he was afebrile, with pulse rate 120/min and blood pressure 130/80 mm Hg. On auscultation, air entry was bilaterally equal with no foreign sounds. Physical examination revealed tachypnoea (30

breaths/minute) and increased work of breathing (use of accessory inspiratory muscles). His RT-PCR test for COVID-19 came out positive on 10th June 2020 after which he was hospitalized in COVID dedicated Tertiary Care Hospital in Mumbai. At the time of admission his SPO₂ was 45% on room air which improved to 80% on giving O₂ (8L/min). He was admitted in the COVID dedicated High Dependency Unit established beside the ICU and was put on BiPAP ventilator mode with FiO₂ 100%. Investigations performed are mentioned in (Table 1). ABG reports are presented in (Table 2).

Table 1: Investigations.

Investigations	Values/Findings	Interpretation
Haemoglobin	12.0 g/dl	Borderline normal
ECG	Heart rate: 87 beats per minute, Premature Ventricular Contractions observed in V5, V6 and was suggestive of Left Axis Deviation.	Suggestive of Left Axis Deviation.
Ferritin	1265 ng/ml	Increased
Interleukin-6	210 pg/ml	Increased
D-Dimer	11.1 µg/ml	Increased
RT-PCR(10/06/2020) (Before hospitalisation)	Positive	COVID positive
RT-PCR(15/06/2020) (3 days of hospitalisation)	Positive	COVID positive
RT-PCR(29/06/2020) (2 weeks after hospitalisation)	Negative	COVID negative

Table 2: Laboratory reports of ABG Analysis from the date of admission.

Date	13/06/2020	16/06/2020	17/06/2020	18/06/2020	21/06/2020
Day of admission	1 st day	4 th day	5 th day	6 th day	9 th day
O ₂ status	BiPAP 100%	BMV 15L/min	BMV 15L/min	BMV 15L/min	BMV 15L/min
pH	7.497	7.467	7.314	7.389	7.384
PCO ₂ (mmHg)	28.1	25.4	27	34.6	44.9
HCO ₃ (mmol/L)	23.2	21.2	15.3	21.3	24.8
PO ₂ (mmHg)	45.8	53.9	55.8	71.1	117
SPO ₂ (%)	85.7	89.5	84.3	93.7	98
PaO ₂ /FiO ₂	45.8	81.67	84.55	107.73	177
Date	22/06/2020	23/06/2020	24/06/2020	27/06/2020	30/06/2020
Day of admission	10 th day	11 th day	12 th day	15 th day	18 th day
O ₂ status	BMV 15L/min	BMV 15L/min	BMV 10L/min	BMV 8L/min	BMV 10L/min
pH	7.411	7.417	7.436	7.443	7.434
PCO ₂ (mmHg)	44.4	44.6	42	33	38.5
HCO ₃ (mmol/L)	26.3	28	27.8	22.1	25.2
PO ₂ (mmHg)	140.1	141.1	191	115.2	122
SPO ₂ (%)	99.2	99.2	99.3	98.4	98.9
PaO ₂ /FiO ₂	212	213.79	374.51	256	239.22

The patient was referred for Physiotherapy on 17th June 2020 (5th day after admission) complaining of breathlessness and dry cough and was on Bag Mask Ventilation (BMV) 15 L/min with ongoing weaning trials. Patient was conscious, co-operative and well oriented to time, place and person. Patient was on medical management as prescribed by the treating doctor which included revival with BiPAP support followed by Bag and Mask ventilation (O₂ status in (Table 3)) and medications mainly including Inj. Piptaz (Broad spectrum antibiotics), Inj. Low Molecular Weight Heparin (anticoagulant), Inj. Methylprednisolone

(immunosuppressant) and Inj. Tocilizumab (IL-6 inhibitor: immunosuppressant). Prior to Physiotherapy treatment, patient's vitals were checked mainly temperature, blood pressure, pulse rate and oxygen saturation on supplemental oxygen support. When all vital parameters were in normal range only then physiotherapy treatment was given presented in (Table 3). Our expected outcome was early weaning from oxygen support, early recovery and independence in Activities of daily living which was achieved during the hospitalization period.

Table 3: Change in vital parameters with inpatient supervised physiotherapy management.

Date	17 th June	18 th June	19 th June	20 th June	22 nd June	23 rd June	24 th June
Physiotherapy treatment day	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
O ₂ Supply(L/min)	BiPAP; 100%	FiO ₂ : BMV 15L	BMV 15L	BMV 15L	BMV 15L	BMV 15L	BMV 10L
Pulse (bpm)	Pre	85	87	85	90	90	103
	Post	88	90	88	113	110	110
SPO ₂ (%)	Pre	96	97	99	97	100	99
	Post	97	99	97	98	100	96
Positioning (side lying)	Y	Y	Y	Y	Y	Y	Y
Prone lying					Y	Y	Y
Breathing Exercises	Y	Y	Y	Y	Y	Y	Y
In bed exercise	Y	Y	Y	Y	Y	Y	Y
Sitting exercises		Y	Y	Y	Y	Y	Y
Standing			Y	Y	Y	Y	Y
Balance exercises in Standing			Y	Y	Y	Y	Y
Spot Marching				Y	Y	Y	Y
Walking					Y	Y	Y
Date	25 th June	26 th June	27 th June	29 th June	30 th June	1 st July	2 nd July
Physiotherapy treatment day	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
O ₂ Supply(L/min)	BMV 10L	BMV 10L	BMV 8L	BMV 6L	BMV 6L	Nasal prongs 2L	Nasal prongs 2L
Pulse (bpm)	Pre	98	88	112	108	102	112
	Post	105	102	102	120	112	120
SPO ₂ (%)	Pre	100	100	99	98	97	98
	Post	95	99	100	98	99	95
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
In bed exercise	Y	Y	Y	Y	Y	Y	Y
Sitting exercises	Y	Y	Y	Y	Y	Y	Y
Standing	Y	Y	Y	Y	Y	Y	Y
Balance exercises in Standing	Y	Y	Y	Y	Y	Y	Y
Spot Marching	Y	Y	Y	Y	Y	Y	Y
Walking	Y	Y	Y	Y	Y	Y	Y

Y: represents exercise was given on that day; BiPAP: Bilevel Positive Airway Pressure; BMV: Bag Mask Ventilation, L/min: litres/ minute, SPO₂: Saturation of peripheral oxygen.

Discussion

COVID-19 caused by SARS-CoV-2 is a novel disease which had emerged in December 2019 in China has now spread rapidly all over the world infecting over 12 million people and has resulted in death of over half a million people (as on 8th July 2020). Since it is novel, literature on the disease and guidelines regarding its modes of transmission, safety precautions, management etc. are constantly being updated as more and more knowledge is being shared globally. There is no definitive treatment for COVID-19 yet, with management mainly focused on symptomatic treatment and development of vaccine seems far. Continuous bombardment with negative news regarding increasing rate of infections and deaths every day, also circulation of controversial messages and videos through various media regarding affected people being taken away forcefully to isolation centres or hospitals and showing lack of resources and pile up of dead bodies at those places has led to heightened anxiety, panic and fear among the common people. This has reduced the faith of common people in the health care system and has

also developed social stigma and taboo against the people affected and even recovered with COVID-19.

There are increased incidents of people not co-operating with the health care workers and hiding their mild symptoms to avoid going to isolation centres and hospitals for treatment. Only on aggravation of symptoms due to respiratory failure, do they report and thereafter their recovery becomes difficult with medical management. The above case also highlights about patient presenting to the hospital on experiencing severe symptoms of COVID-19 [5]. The above case presents successful treatment of the patient through holistic approach mainly medical management including nutrition, physiotherapy management and psychological counselling of the patient. The successful treatment of the patient despite having severe symptoms will help restore faith and confidence of the common people in the health care system and would encourage people to co-operate and report early even with milder symptoms so can be effectively treated. Patient’s ABG report immediately after admission revealed hypoxaemia, hypocapnia with

PaO₂/ FiO₂ ratio 45.85 indicating Type 1 respiratory failure and severe ARDS [8]. X-ray revealed ground glass opacities, reduction in the air entry, obliteration of cardiophrenic and costophrenic angles and some fibrotic changes bilaterally seen in (Figure 1 & 2).



Figure 1: A-P view Chest X-ray (1st day of Admission), bilateral patchy ground glass opacities right more than left.

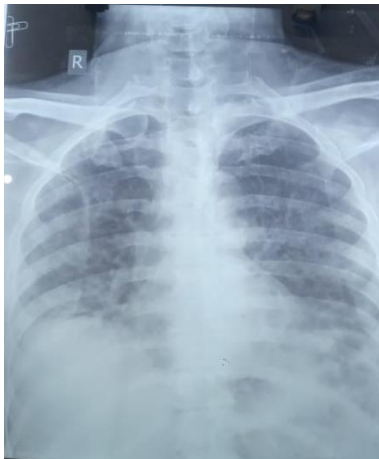


Figure 2: A-P view Chest X-ray (5th day post admission), Ground glass opacities and fibrotic changes visible bilaterally.

The patient was properly counselled by the treating doctor regarding his health condition and medical treatment for the same to bring down anxiety and fear of the patient owing to severe symptoms of COVID-19. Patient was on medication regime as prescribed by the treating doctor and was provided a healthy nutritious diet by the hospital. Subsequent ABG reports revealed improvement in PaO₂ levels on giving supplemental oxygen signifying the presence of ventilation perfusion mismatch, such patients are able to maintain satisfactory level of arterial oxygenation without requiring intubation and mechanical ventilation [9]. The patient was referred for Physiotherapy on the 5th day after admission. Physiotherapy treatment was given along with supplemental oxygen support according to the published guidelines for physiotherapy practice in COVID-19 [2, 6, 10]. Patient's pulse rate and oxygen saturation were continuously monitored during each exercise using pulse oximeter and exercises were progressed depending on patient's Rate of Perceived Exertion (RPE) and maintenance of normal ranges of vitals during the exercise with help of adequate rest between exercises. Exercises were

progressed from gentle in-bed limb movements, relaxation and breathing exercises, to limb and breathing exercises with patient sitting bedside and progressed to spot marching and ambulation.

In-bed exercises mainly included ankle toe movements, heel slides, active range of motion exercises of wrist, elbow and shoulder joints and diaphragmatic breathing exercises for relaxation in propped up supine position (5-10 repetitions). These exercises ensured normal mobility of the joints and prevented complications due to immobility like deep vein thrombosis. Positioning was taught to the patient and was asked to perform every 2 hourly as per the COVID Awake Repositioning/ Prone Protocol (CARP protocol) to improve hypoxaemia which involved switching after every 10-15 minutes between left side-lying, right side lying and sitting upright 60 -90 degrees [11]. Prone positioning was started as per tolerance of the patient from 5 minutes and gradually increased to 30 minutes/session asking the patient to perform it 3 to 4 times a day. Positional changes also helped to prevent bed sores and its related complications. Further progression involved taking the patient into bed side sitting and performing active Upper limb and Lower limb range of motion exercises followed by breathing exercises (All 5-10 repetitions).

Breathing exercises involved diaphragmatic and segmental breathing along with thoracic expansion exercises. When patient started tolerating sitting position, progression was made to standing position. Initially the patient felt giddy which improved when patient spent more time sitting upright as advised. When the patient started tolerating standing position and maintaining normal vitals in standing, he was progressed with spot marching, rotation of head and trunk for balance training (5-10 repetitions) and walking sideways besides the bed (5 steps on each side). On subsequent days when the complaints of giddiness subsided, progression was made with patient made to walk around the bed (2 circles). As per the guidelines, drop of oxygen saturation of >3 percent and/or increase in the pulse rate above 120 beats per minute meant terminating the exercise and giving rest to the patient to restore the normal resting oxygen saturation and pulse rate and continuing thereafter if these vitals are stable [2, 6, 10]



Figure 3: A-P view Chest X-ray (7th day post admission), an improvement in air entry bilaterally.

Physiotherapy intervention along with medical management helped in improving ventilation perfusion mismatch, alveolar ventilation by optimizing oxygen transport and in maintaining normal fluid distribution in the body [12]. It also helped to prevent complications of bed rest, deconditioning and muscle weakness [13]. The physiotherapy management in parallel with medical management, nutritional care and counselling of the patient ensured excellent recovery, objectively demonstrated by improvement in the latter ABG reports and X-rays (Figures 3 & 4).



Figure 4: A-P view Chest X-ray (15th day post admission), bilateral fluffy shadows seen indicative of resolving ARDS.

The patient was able to maintain normal oxygen saturation (98%) on 2L/min oxygen supplementation with normal vitals after 18 days of hospitalisation and 14 days of physiotherapy treatment parallelly with the medical management in the High Dependency Unit. He was later transferred to a general COVID ward (on maintaining normal oxygen saturation on 2L/min) where medical and physiotherapy treatment continued and was finally discharged when he started maintaining normal oxygen saturation on room air.

Conflicts of Interest

None.

Funding

None.

Acknowledgements

The authors acknowledge Dr. Mohan Joshi (Dean) for allowing us to carry out this study, Dr. Rachna Arora (Assistant Professor, Physiotherapy Department) for assistance in editing and reviewing, Dr. Rosemarie Desouza (Professor, Department of Internal Medicine), Patient whose information was used, All Postgraduate Students, faculty and Staff Members of Physiotherapy School & Centre, T.N.M.C & B.Y.L.Ch Nair Hospital.

Ethical Approval

Our institution, Topiwala National Medical College and B. Y. L. Nair Ch. Hospital does not require ethical approval for reporting individual cases or case series.

Consent

Written informed consent was obtained from the patient for their anonymized information to be published in this article.

Abbreviations

SPO₂: Saturation of Peripheral Oxygen
ICU: Intensive Care Unit
mMRC: Modified Medical Research Council
RT-PCR: Reverse Transcription Polymerase Chain Reaction
BiPAP: Bilevel Positive Airway Pressure
ECG: Electrocardiogram
ABG: Arterial Blood Gas
PaO₂: Partial Pressure of Oxygen
FiO₂: Fraction of Inspired Oxygen
ARDS: Acute Respiratory Distress Syndrome
RPE: Rate of Perceived Exertion
CARP: COVID Awake Repositioning Protocol
BMV: Bag Mask Ventilation
O₂: Oxygen
PCO₂: Partial Pressure of Carbon Dioxide
HCO₃: Bicarbonate
L/min: Litres/min
Inj.: Injection
IL-6: Interleukin-6
g/dl: Gram/decilitre
ng/ml: Nanogram/millilitre
pg/ml: Picogram/millilitre
µg/ml: Microgram/millilitre
A-P: Anteroposterior
mmHg: Millimeters of mercury
mmol/L: millimoles/Litre

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