

Case Study

A Road Map to Recovery of a Hypertensive Covid-19 Positive Patient with Tailor Made Physiotherapy Intervention and Yoga Nidra: A Case Study

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Abstract: The new virus that erupted last year known as corona virus 2019 has brought the world to a standstill. Clinical manifestations of covid-19 include fever, cough, myalgia, fatigue, sputum production and shortness of breath. The severity of disease ranges from asymptomatic infection or mild upper respiratory tract infection to severe pneumonia with respiratory failure to death. Physiotherapy plays a crucial role in the management of intubated as well as nonintubated patients admitted in the ICU, thereby helping the patient progress in their recovery. This case study highlights the importance of a Tailor-made Physiotherapy Intervention both in patient and post covid rehab in improving the quality of life of 56-year-old male, with a history of hypertension with complain of fever, coughing, reduced oxygen saturation (SpO₂), lower limb swelling and upper limb weakness. With the entire experience of ICU and post covid rehabilitation we concluded that Chest physiotherapy along with structured exercise program improves the respiratory function in patients with covid-19. It is not only useful in post covid rehabilitation but also in critical care setting. Also, relaxation therapy like Yoga Nidra should be included in rehabilitation protocol to reduce the stress like psychological effects to help control related comorbidities like hypertension.

Keyword: Covid-19, physiotherapy intervention, rehabilitation, hypertension, yoga nidra, case report.

Introduction

The new virus that erupted last year known as corona virus 2019 has brought the world to a standstill. The global pandemic has created a ruckus due to ever changing nature of virus with ever evolving symptoms and high transmission. The virus spreads mainly through droplets.^[1] Once infected, virus enters the lungs and damages the alveolar cells by binding with ACE 2.^[1,2] Alveolar cells functions to synthesize and secrete surfactant, carry out xenobiotic metabolism, help with transepithelial movement of water, and regenerate alveolar epithelium following lung injury.^[3] Thus damage to alveolar cells results in respiratory problems along with other clinical systemic manifestations. Clinical manifestations of covid-19 include fever, cough, myalgia, fatigue, sputum production and shortness of breath. The severity of disease ranges from asymptomatic infection or mild upper respiratory tract infection to severe pneumonia with respiratory failure to death.^[4] In

addition, headache, dizziness, generalized weakness, vomiting and diarrhea are also observed.^[5] The more common causes of morbidity and death in these patients include pneumonia and respiratory failure. This requires patients to artificially ventilate and other techniques that can improve respiratory function. One of these techniques is chest physiotherapy. COVID-19 patients with comorbidities like diabetes, hypertension and other cardiovascular and cerebrovascular diseases yield poorer clinical outcomes.^[6]

Chest physiotherapy has shown to improve gas exchange, reverse pathological progression, and reduce or avoid the need for artificial ventilation when it is provided very early in other respiratory conditions.^[7] In ICU, the focus is on improving pulmonary function, early mobilization and prevents complications. While in wards it helps in early weaning of oxygen support, improve lung functions, prevent weakness and early recovery of patient.^[8] Post discharge, chest physiotherapy in the form of respiratory muscle training, cough exercise, diaphragmatic training, stretching exercise, and home exercise have resulted in improved FEV1 (L), FVC (L), FEV1/FVC%, diffusing lung capacity for carbon monoxide (DLCO%), endurance, and quality of life, and a reduction in anxiety and depression symptoms.^[7]

Post discharge some patients still show desaturation with minimal activities along with reduced cardiovascular endurance, generalized and muscular weakness and stress, depression and anxiety like psychological effects due to the effect of covid-19. All these might impact the already present comorbid condition and might deteriorate the condition. Relaxation therapy like Yoga nidra can help in this. Nevertheless, there are no studies that evaluate the efficiency of physiotherapy for COVID-19 patients with underlying diseases. This case study aims to clarify the effect of physiotherapy intervention on functional performance of COVID 19 patient with co-morbidities.

Case description

A 56 years old male with known case of hypertension has recently been diagnosed with Covid-19. He was tested antigen positive on development of breathlessness and body ache on 18th of September 2020 and was isolated at home. His symptoms worsened and developed fever, coughing, reduced oxygen saturation (SpO₂), lower limb swelling and upper limb weakness. On 21st September 2020 he was hospitalized with RT-PCR report positive and oxygen saturation of 86%. He was in ICU for first five days where oxygen therapy was administered through NRBM. With further improvement, he was shifted to ward. Medications prescribed to him during hospital stay were tab fabiflu, tab paracetamol, tab cefixime, tab zinc sulphate and other supplements. On 5th October 2020 he was tested antigen negative and was discharged. While his entire stay at hospital he was given physiotherapy treatment in form of breathing exercises, mobility exercises, prone positioning, chest expansion and chest clearance exercises.

Table 1. Treatment during ICU stay

Day	Treatment
1	Breathing Control Exercises [5 reps, 2 sets, 3 times], Ankle Toe Movements [10 reps, 3 sets, 3 times]
2	Breathing Control Exercises [5 reps, 2 sets, 3 times], Ankle Toe Movements [10 reps, 3 sets, 3 times]
3	Breathing Control Exercises [10 reps, 2 sets, 2 times], Ankle Toe Movements [10 reps, 3 sets, 3 times]
4	Breathing Control Exercises [10 reps, 3 sets, 3 times], Ankle Toe Movements [10 reps, 3 sets, 3 times], Chest Expansion Exercises [10 reps, 2 times]
5	Breathing Control Exercises [10 reps, 3 sets, 3 times], Ankle Toe Movements [10 reps, 3 sets, 3 times], Chest Expansion Exercises [20 reps, 3 times]

Table 2. Monitoring of vitals in ICU

Day	SpO₂ (in %)	RR (in bpm)	PR (per minute)	SBP (mm Hg)	DBP (mm Hg)
1	86-88	26	71	136	88
2	86-88	24	85	134	90
3	86-87	25	82	134	86
4	88-90	25	81	134	88
5	89-90	24	84	132	86

Table 3. Treatment during ward stay

Day	Treatment
1	Deep Breathing Exercise [10 reps, 3 sets, 3 times], Active Cycle Breathing Technique [2 reps, 3 times], Bed Side General Mobility Exercises [10 reps, 2 sets, 3 times], Chest Expansion Exercises [5 reps, 2 sets, 3 times]
2	Deep Breathing Exercise [10 reps, 3 sets, 3 times], Active Cycle Breathing Technique [2 reps, 3 times], Bed Side General Mobility Exercises [10 reps, 2 sets, 3 times], Chest Expansion Exercises [5 reps, 2 sets, 3 times]
3	Deep Breathing Exercise [10 reps, 3 sets, 3 times], Active Cycle Breathing Technique [2 reps, 3 times], Bed Side General Mobility Exercises [10 reps, 2 sets, 3 times], Chest Expansion Exercises [5 reps, 2 sets, 3 times]
4	Deep Breathing Exercise [10 reps, 3 sets, 3 times], Active Cycle Breathing Technique [2 reps, 3 times], Bed Side General Mobility Exercises [10 reps, 2 sets, 3 times], Chest Expansion Exercises [5 reps, 3 sets, 3 times]
5	Deep Breathing Exercise [15 reps, 2 sets, 3 times], Active Cycle Breathing Technique [3 reps, 3 times], Bed Side General Mobility Exercises [10 reps, 2 sets, 3 times], Chest Expansion Exercises [10 reps, 2 sets, 3 times]
6	Deep Breathing Exercise [15 reps, 2 sets, 3 times], Active Cycle Breathing Technique [3 reps, 3 times], Bed Side General Mobility Exercises [10 reps, 2 sets, 3 times], Chest Expansion Exercises [10 reps, 2 sets, 3 times], On Spot Marching
7	Deep Breathing Exercise [15 reps, 2 sets, 3 times], Active Cycle Breathing Technique [3 reps, 3 times], Bed Side General Mobility Exercises [10 reps, 2 sets, 3 times], Chest Expansion Exercises [10 reps, 3 sets, 3 times], On Spot Marching
8	Deep Breathing Exercise [15 reps, 3 sets, 3 times], Active Cycle Breathing Technique [3 reps, 3 times], Bed Side General Mobility Exercises [10 reps, 2 sets, 3 times], Chest Expansion Exercises [10 reps, 3 sets, 3 times], On Spot Marching, Bed Side Walking with support
9	Deep Breathing Exercise [15 reps, 3 sets, 3 times], Active Cycle Breathing Technique [3 reps, 3 times], Bed Side General Mobility Exercises [10 reps, 2 sets, 3 times], Chest Expansion Exercises [15 reps, 2 sets, 3 times], Bed Side Walking
10	Deep Breathing Exercise [15 reps, 3 sets, 3 times], Active Cycle Breathing Technique [3 reps, 3 times], Bed Side General Mobility Exercises [10 reps, 2 sets, 3 times], Chest Expansion Exercises [15 reps, 2 sets, 3 times], Walking

Table 4. Monitoring of vials in ward

Day	SpO ₂ (in %)	RR (in bpm)	PR (per minute)	SBP (mm Hg)	DBP (mm Hg)
1	91-92	24-25	70	132	88
2	91-92	24-25	70	132	86
3	91-93	24-25	74	132	86
4	91-93	22-24	72	132	86
5	92-93	20-22	70	130	86
6	93-94	20-22	72	130	86
7	93-95	20-22	71	130	84
8	96-97	16-18	72	128	84
9	96-97	15-16	72	126	84
10	96-98	14-15	70	126	82

After one month patient was put on post covid rehabilitation with chief complain of weakness and tiredness on walking, generalized weakness and 90% SpO₂.

Physiotherapy treatment was planned keeping in mind to improve cardio-pulmonary endurance, increase oxygen saturation, and improve muscle endurance and strength and overall well-being.

Treatment protocol was as per table no. 5 and monitoring of SpO₂, respiratory rate, pulse rate, SBP, DBP and exertion score (modified borg scale) was as per table no. 6.

Table 5. Post covid rehabilitation protocol

Week	Exercise Training
1	Warm Up: 4 min Upper limb and Lower limb stretching Aerobic: Cycle Ergometer level 1 5 mins, 2 sets Mobility exercises: Arm Curls Breathing Exercises: Diaphragmatic breathing 15 repetitions Spirometry 500 ml Reps 2 sets (focusing on expiration) Yoga Nidra: 15 mins Cool Down: 4 mins Deep breathing Stretching Home exercises: Walking 20-25 mins Breathing exercises
2	Warm Up: 4 min Upper limb and Lower limb stretching Aerobic: Cycle Ergometer level 1 to 2 (with resistance) 5 mins, 2 sets Mobility exercises: Arm Curls Breathing Exercises: Diaphragmatic breathing 20 repetitions Spirometry 650 ml Reps 2 sets

	(focusing on expiration) Yoga Nidra: 15 mins Cool Down: 4 mins Deep breathing Stretching Home exercises: Walking 20-25 mins Breathing exercises
3	Warm Up: 4 min Upper limb and Lower limb stretching Aerobic: Cycle Ergometer level 2 to 4 (with resistance) 10 mins, 2 sets (Interval 5 mins) Mobility exercises: Arm Curls Breathing Exercises: Diaphragmatic breathing 20 repetitions Spirometry 800 ml Reps 2 sets (focusing on expiration) Yoga Nidra: 15 mins Cool Down: 4 mins Deep breathing Stretching Home exercises: Walking 20-25 mins Breathing exercises
4	Warm Up: 4 min Upper limb and Lower limb stretching Aerobic: Cycle Ergometer level 2 to 4 10 mins, 2 sets (interval 5 mins) Mobility exercises: Arm Curls Breathing Exercises: Diaphragmatic breathing 20 repetitions Spirometry 900 ml Reps 2 sets (focusing on expiration) Yoga Nidra: 15 mins Cool Down: 4 mins Deep breathing Stretching Home exercises: Walking 20-25 mins Breathing exercises

Table 6. Monitoring of vitals in post covid rehabilitation

	Average of one week					
Week	SpO ₂ (in %)	RR (in bpm)	PR (per minute)	SBP (mm Hg)	DBP (mm Hg)	Modified Borg Scale
1	89-90	15	89	134	90	4-5
2	89-92	15	90	134	92	4
3	94-95	12	90	126	86	1-2
4	97-98	14	92	132	84	0-0.5

Discussion

Most patients diagnosed with covid-19 have primarily respiratory symptoms with oxygen desaturation and generalized weakness. While the presences of comorbidities like hypertension, diabetes mellitus, thyroid dysfunction, obesity, renal dysfunction increases their mortality and morbidity. This patient had hypertension as preexisting risk factors of severe COVID-19 symptoms. Such patients need tailored made pulmonary rehabilitation along with counseling to improve their overall quality of life.

In critical care the aim of physiotherapy treatment is to prevent pulmonary complications, improve oxygen saturation, and focus on early mobilization to improve complications due to immobilization and ICU acquired weakness. Body positioning, airway clearance techniques, breathing exercises, chest expansion exercises and mobility exercises help to combat ill effects of deconditioning and improve quality of life.^[9]

It was considered that patients with severe COVID-19 need rehabilitation therapy in the acute phase to improve physical function. However, infection control is also important. Therefore, during hospitalization, the rehabilitation therapy was performed only in the isolation area for patients with COVID-19; PPE was used and respiratory physiotherapy that generates aerosols was avoided.

Rehabilitation therapy was started the day patient was admitted to the hospital with 86% SpO₂ and weakness in limbs in form of breathing exercises, chest clearance techniques and mobility exercises. Although the patient did not meet the diagnostic criteria for ICU-acquired weakness, he had muscle weakness in his extremities on the day he was transferred from the ICU to the general ward (day 6) after having received oxygen therapy via Non re-breather mask (NRBM). When the patient was discharged (day 15), muscle weakness and exercise intolerance persisted, but his capacity to perform activities required for daily living improved to the level of independence at his home. One month after discharge, patient joined post covid rehabilitation to improve his oxygen tolerance, cardiovascular endurance and to improve functional capacity by improving muscular strength and endurance.

Yoga Nidra was also included in the rehabilitation protocol to reduce the stress and control/maintain the blood pressure.^[10] It helps by reduction in sympathetic arousal and reduced emotional distress and improves quality of sleep.^[11,12] Rejuvenate the body and helps to keep the mind calm.^[13]

Post 4 weeks of rehabilitation good recovery of physical function was observed. Therefore, mobilization in the acute phase is a necessary component of rehabilitation therapy for severely affected COVID-19 patients.

Structured exercise program focusing on aerobic training, breathing exercises, mobility and strengthening helps to restore the cardio-pulmonary endurance in post covid patients.

Sudden desaturation with minimal change of position is common feature with COVID19 pneumonia patients. Utmost care should be taken during intervention and continuous monitoring of saturation should be done. With drop in 4-5% of SpO₂ intervention should be discontinued. Several strategies were implemented during session to control the sudden desaturation and proved to be effective to reduce risk of sever desaturation. The patient was given rest break in between exercises with breathing control exercise, and slow progress of intensity of exercises with continuous observation of saturation by pulse oximeter along with measurement of blood pressure in hypertensive patients.

Conclusion

Chest physiotherapy along with structured exercise program improves the respiratory function in patients with covid-19. It is not only useful in post covid rehabilitation but also in critical care setting.

However, it should be noted that while administering physiotherapy for covid patients proper measure and personal protective equipments should be used to prevent cross infection.

Clinical significance

Chest physiotherapy along with early mobilization, aerobic training and resisted exercises is useful tool to treat covid-19 patients and rehabilitate them. Also, relaxation therapy like Yoga Nidra should be included in rehabilitation protocol to reduce the stress like psychological effects to help control related comorbidities like hypertension.

Consent

Informed consent was obtained from the patient for his anonymized information to publish in this article.

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Conflicts of interest

The authors declare no conflicts of interest.

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