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Case Report

Combined effect of positioning and conventional respiratory physical therapy in complicated case of COVID-19: a case report

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ABSTRACT

Many neurological and cardiovascular complications have been discovered post-COVID 19 infections. Long-term pulmonary complications like pneumonia, respiratory failure, ARDS, and lung abscess are described in different studies. To overcome these complications respiratory chest physiotherapy plays an important role for an individual. Respiratory chest physiotherapy has been 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. This case study highlights the combined effects of positioning with conventional Respiratory chest physiotherapy in post-COVID 19 respiratory complications in a 26-year-old young individual, presenting with complaints like dyspnoea. Changes in modified medical research council (MMRC) score and chest X-ray were seen by end of discharge of the patient.

Keywords: COVID-19, Positioning, Chest physiotherapy, Respiratory complications

INTRODUCTION

Severe acute respiratory syndrome Corona virus 2 (SARS-CoV-2) is the cause of Coronavirus disease 2019 (COVID-19) which turned out to be an emerging viral infection that was rapidly spreading across the globe and three months after its emergence, the world health organization declared it a pandemic. Several hospitals needed to prepare and create guidelines for the healthcare team for coping and managing these patients.[1]

In India, from 3 January 2020 to 14 December 2021, there have been 34,703,644 confirmed cases of COVID-19 with 475,888 deaths, reported to WHO. [2]

Patients with COVID-19 can present influenza-like signs and symptoms like fever, cough, fatigue, excessive pulmonary secretion, and breathlessness. The disease can appear as mild lower respiratory tract illness through severe viral pneumonia with acute respiratory distress syndrome (ARDS) and even death.[3] Pulmonary physiotherapy is a comprehensive therapeutic method that is aimed to improve a patient's respiratory symptoms, effective cough, clear the airways, increase symptoms of dyspnea, reduce the complications related to disease, minimize disability, and finally improve the health-related quality of life (HRQOL). [4]

CASE REPORT

A 26-year-old male was diagnosed with COVID-19 on 3rd May 2021. He was tested antigen-positive on symptoms like loss of taste and smell. The patient was brought to the COVID facility of the hospital. The patient complained increased level of breathlessness. HRCT score was 12. He was on BiPAP mode of the mechanical ventilator with FiO_2 of 100%, PEEP was 6 cm of H_2O.

On 25th May, the patient RTPCR test came negative. HRCT score was 20 on 25. The patient was shifted to the respiratory critical unit due to tachycardia and tachypnoea at rest. He experienced MMRC grade 4 of breathlessness. Patients' saturation of oxygen was 97% on BiPAP mode of the mechanical ventilator with FiO_2 of 100%, PEEP was 6 cm of H2O. The patient was on antibiotics, anticoagulants, multivitamins, antacids, and mucolytic agents. Reduced breath sounds with crepitus over the basal segment bilaterally on auscultation and decreased chest expansion was noted. During ICU and ward stay the patient was given physiotherapy treatment given in Table 2 and 4. Daily monitoring of vitals throughout the treatment in ICU (Table 3).

Pre-chest-X-ray explanation

Pre chest X-ray of 26-year-old patient shows fibrotic changes and patchy opacity on both the sides. It also shows honey comb appearance.

Figure 1: Pre-chest-X-ray.

Treatment

X-ray changes have been noticed post 11 days and with a reduction in grade of breathlessness on the MMRC scale.

Table 2: Treatment in ICU.

Day	Treatment	Dosage (3 times/day)
1, 2, 3, 4	Prone positioning mechanical vibration	20-30 mins
	Breathing control	6 reps, 2 sets
	Ankle toe movements	10 reps, 2 sets
5, 6, 7	Prone positioning mechanical vibration	30 mins
	Breathing control	10 reps, 2 sets
	Thoracic expansion exercise	10 reps, 2 sets
	Heel slides	10 reps, 2 sets
	Ankle toe movements	15 reps, 2 sets
8, 9, 10, 11	Prone positioning	60 mins
	Breathing control	10 reps, 3 sets
	Thoracic expansion with 2 secs inspiratory hold exercise	10 reps, 2 sets
	Incentive spirometry	5 reps, 3 sets
	Bedside sitting and standing with dyspnea relieving positions	5-10 mins
	Ankle toe movements	15 reps, 3 sets

Table 3: Monitoring in ICU.

Day	Heart rate (beats per minute)	SpO_2 (%)	Ventilatory status	Respiratory rate (cycles per minute)	Blood pressure (mmHg)
1	112	97	BiPAP mode- 100% FiO_2 PEEP 6 cm H_2O	40	124/70
2	116	92		34	150/100
3	80	97		30	120/70
4	116	95	BiPAP mode- 90% FiO_2 PEEP 6 cm H_2O	32	146/90
5	132	96	BiPAP mode- 60% FiO_2 PEEP 3 cm H_2O	30	136/88
6	120	95	BiPAP mode- 50% FiO_2 PEEP 3 cm H_2O	32	140/90
7	126	95	BiPAP mode- 35% FiO_2 PEEP 3 cm H_2O	28	130/80
8	122	96	8 lit/min O_2 via face mask	30	128/84
9	114	95	6 lit/min O_2 via nasal cannula	26	130/88
10	120	95		27	132/82
11	114	98	2 lit/min O_2 via nasal cannula	24	130/80

Table 4: Treatment in wards.

Day	Treatment	Dosage (3 times/day)
12, 13	Prone positioning	60-90 mins
	Active cycle of breathing technique	2 cycles
	Incentive spirometry	10 reps, 3 sets
	Bedside mobility exercise	
	Ankle toe movements	15 reps, 3 sets
	Sit-to-stand	6 reps, 2 sets
	Spot marching	10 reps, 2 sets
14	Prone positioning	60-90 mins
	Active cycle of breathing technique	2 cycles
	Incentive spirometry	10 reps, 3 sets
	Bedside mobility exercise	
	Sit-to-stand	10 reps, 2 sets
	Spot marching	10 reps, 2 sets
	Walking around bed	
15	Prone positioning	1-2 hours
	Active cycle of breathing technique incentive spirometry	2 cycles
	Walking	10 reps, 3 sets

Post chest X-ray

Post chest X-ray of 26-year-old patient shows normal findings with bronchovesicular markings.

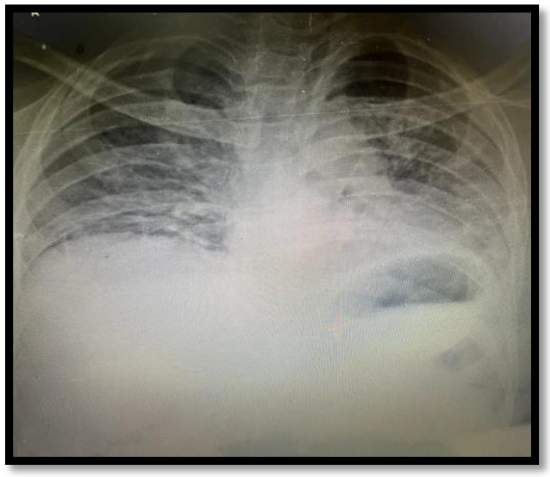

Figure 2: Post chest X-ray.

Outcome

Table 5: Outcome measures.

Parameters	Pre	Post
MMRC	Grade 4	Grade 0
HRCT score	12	20
Vitals		
SpO_2	92	98
Heart rate	112	114
Respiratory rate	40	24
Blood pressure	124/70	130/80
X-ray	Figure 1	Figure 2

DISCUSSION

Patients diagnosed with COVID-19 have primarily respiratory symptoms with oxygen desaturation and generalized weakness. Patients need to be tailored to make pulmonary rehabilitation and counselling to improve their quality of life. This patient had severe breathlessness on movement so such specific treatment was given. In the critical care unit, physiotherapy aims to prevent pulmonary complications, improve oxygen saturation, and focus on early mobilization to avoid complications and ICU acquired illness. Positioning, breathing exercise, chest expansion exercise and mobility exercises help to prevent illness and improve quality of life.

Respiratory physiotherapy: mechanism of action

Chest physiotherapy, including clearance techniques and positioning in prone mainly, assists oxygenation in patients who are in critical care.[5] In particular, aggregate airway secretions can be moved by use of percussion and vibration technique.[6] Active cycle of breathing techniques (ACBT) that are accomplished by patients independently can also help the clearance of pulmonary secretions, improve lung function, and ameliorate effective cough in these patients. Three components defined for this technique are breathing control, deep breathing or thoracic expansion exercises, and forced expiratory techniques like huff and cough.[7]

Prone ventilation refers to the distribution of mechanical ventilation with the patient lying in the prone position.[8] It is used for the treatment of ARDS as an approach to improve oxygenation and was first proposed in the 1970s as a method to improve gas exchange in ARDS. To reduce atelectasis in injured lungs, a study by Bryan et al proposed prone positioning, theorizing that it would

reduce pleural pressure gradients and restore aeration to dorsal lung segments.[9] The enhancement of oxygenation during prone ventilation is multifactorial but occurs mainly by reducing lung compression and improving lung perfusion. Changes in the distribution of extravascular lung fluid and secretions may also play a role. [10]

CONCLUSION

Positioning combined with conventional respiratory chest physiotherapy thus improves oxygen and ventilation in form of reduction in breathlessness and changes in the X-ray. There are improvements in MMRC score, HRCT, vitals, and in X-ray after treatment in complicated post COVID-19 case.

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