Breathing exercise and chest physiotherapy in post-acute COVID-19 patient: a case report

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ABSTRACT

Background: Severe acute respiratory syndrome (SARS CoV2) and coronavirus disease 2019 (COVID-19) causes vary from mild to severe clinical manifestation. Complications from COVID-19 can show several manifestations such as pulmonary, cardiovascular, neuromuscular, and renal systems, which could lead to multi-organ failure. Lung fibrosis and recurrent pneumonia are some of some sequelae of survivors, and some need readmission to hospital, although the PCR swab test remains negative. Post-acute COVID-19 is a syndrome characterized by persistent clinical symptoms beyond four weeks from the onset of acute symptoms.

Case: In this writing, a 57-year-old male presented with chief complaints of shortness of breath and cough 2 days after being discharged from the hospital because of a COVID-19 infection. His PCR swab test result remains negative when readmission. The patient was on non-invasive ventilation, medical therapy and physical therapies such as breathing exercises and chest physiotherapy. The physical therapy was done twice daily. On the seventh day of exercise, the shortness of breath was improved, and NIV was tapered down. The patient was discharged after 27 days of hospitalization.

Conclusion: This case shows the benefit of breathing exercises and chest physiotherapy for the Post-acute COVID-19 patient. This helps improve respiratory muscle strength and chest expansion in order to improve oxygen perfusion.

Keywords: breathing exercise, chest physiotherapy, post-acute COVID-19, rehabilitation.


INTRODUCTION

Coronavirus (CoV) came from the word corona, which means crown in Latin. In the present day, novel CoV is called severe acute respiratory syndrome (SARS CoV2) and coronavirus disease 2019 (COVID-19). It causes vary from mild to severe clinical manifestation. Complications from COVID-19 can show several manifestations such as pulmonary, cardiovascular, neuromuscular, and renal systems, which could lead to multi-organ failure. COVID-19 was first discovered in Wuhan, Hubei province China in December 2019 and spread throughout the world until WHO declared it as a pandemic. As of January 2022, the outbreak had reached 323,610,370 confirmed cases and 5,529,623 confirmed death cases.

Critically ill COVID-19 patients often require ICU, mechanical ventilation and a long length of stay. Severe clinical manifestation survivors of COVID-19 also face long term burdens after discharge from the hospital, such as impairment (e.g., muscle weakness) and limitation of activities, resulting in participation restrictions that need continuous rehabilitation after hospital discharge. Exercise such as breathing exercise and chest physiotherapy promotes health for inpatient and discharged patients, but only a little amount of research has been done. Exercise has proven to improve the physical and mental health of the recovery COVID-19 patients by improving lung function and immunity. Early physiotherapy should be started as soon as possible, and even the patient is using mechanical ventilation yet. Sputum production is reportedly in 34% of COVID-19 patients. Thus early chest physiotherapy interventions are beneficial for reducing complications, minimizing disability, and maintaining physiological functions and life quality. Although early rehabilitation is beneficial, the rehabilitation in ICU may not be the same as it is for inpatients other than in ICU. The high risk of nosocomial infection is the major reason, so the role of rehabilitation in ICU remains debatable. Rehabilitation techniques are slowly moving into self-supervised and self-monitoring manner via telemedicine, possibly in order to limit a person-to-person contact and nosocomial spread. Studies have reported equal outcomes between telemedicine rehabilitation and person-to-person-based rehabilitation. Inpatient, discharged, and outpatient physical exercise are equally important.

It is clear that some patients are left with ongoing symptoms even after recovering from acute illness. Outpatient exercise therapies should be kept going to prevent long term harm and unwanted readmission to the hospital. Lung fibrosis and recurrent pneumonia are some sequelae of survivors, and some need...
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readmission to hospital, although the PCR swab test remains negative. Post-acute COVID-19 is a syndrome characterized by persistent clinical symptoms beyond four weeks from the onset of acute symptoms. Some studies stated some descriptions of Post-acute COVID-19 such as Long COVID, Long hauler COVID, Chronic COVID syndrome, Subacute or persistent COVID-19, Chronic or post-Covid syndrome despite different descriptions each term this writing use Post-acute COVID-19 term. Despite various techniques, chest physiotherapy and breathing exercise are considered helpful for acute phase, discharge and outpatient. Studies have shown physical rehabilitation is necessary for improving COVID-19 survivors’ quality of life. This case report will describe a case of a Post-acute COVID-19 patient who needed readmission because of recurrent pneumonia and shortness of breath that improved by serial chest physiotherapy and breathing exercise.

CASE PRESENTATION

A 57-year-old male presented with complaints of shortness of breath and cough since three days before admission to Bali Mandara Regional General Hospital. He also had a fever since three days ago. He had a history of COVID-19 6 weeks before readmission, got treated in an intensive care unit (ICU) for four weeks, and was discharged from the hospital after 2 negative PCR tests. The patient doesn’t have any past medical history except for COVID-19. He has allergic to amoxicillin. The patient then did PCR tests two times, and the results remained negative. The thorax x-ray revealed pneumonia and cardiomegaly.

On admission to the emergency room patient had 87% oxygen saturation, then 6 liters per minute of non-invasive ventilation (NIV) oxygen by face mask was given. Oxygen saturation shows 95% until the patient is moved into the isolation ward with medical medication such as intravenous fluid 20 drops per minute, Combivent nebulizer QID, Pulmicort nebulizer QID, intravenous Methylprednisolone BID, intravenous Paracetamol TID, intravenous N-Acetyl Cysteine BID, intravenous omeprazole BID, Lovenox SID subcutaneous, Vestein syrup TID orally, Codein TID orally, L-Bio BID orally, Angintriz MR orally BID, Atorvastatin orally SID, Coralan BID orally, Sertralin SID orally, Risperidone BID orally, Cal-95 SID orally, Vitamin B1 SID orally.

The treatment started with breathing exercises and then chest physiotherapy. On the first day, we began to exercise with breathing exercises only due to his inadequate breathing effort. In supine position and with both knees bent patient was instructed to put both his hands on the chest and on the abdomen, then he was instructed to inhale through the nose while seeing his abdomen moving up, the expiration through his mouth using the forced expiration technique. The patient performs the breathing exercise twice daily for 10 minutes each exercise session. On the seventh day, we replace his face mask with a nasal cannula with 3 liters per minute of oxygen due to his oxygen saturation and shortness of breath improvement. In the sitting position, the patient was instructed to take a deep inspiration to make a full chest expansion and recoil. When deep inspiration patient was also instructed to flexion his shoulder until his arms were below his head, then abduct until approximately 90 degrees and while expiration, he was instructed to slowly move his arms back to before deep inspiration. The patient was also trained for effective cough by being instructed to take a deep breath through the nose, then do the cough only one-two times cough. Cough exercises aim to effectively clear the sputum in the lungs. Patients were instructed to do active cycle breathing techniques, clapping thorax technique in which performed by the staff, forced expiratory technique. In order to avoid complications due to lower limb immobility, the patient was instructed to move his lower limb by raising the lower limb and move ankle, toe, and heel.

Table 1. Patient’s laboratory test result.

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<th>Parameter</th>
<th>Result</th>
<th>Parameter</th>
<th>Result</th>
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<td>Hb (g/dL)</td>
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<td>NLR</td>
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Figure 1. Chest x-ray showed consolidation on both lungs, indicating bilateral pneumonia and cardiomegaly.

Table 1. Patient’s laboratory test result.
DISCUSSION

Limited published data at the current time, the precise pathophysiology of post-acute COVID-19 syndrome is unknown. It is considered multifactorial such as systemic inflammatory response syndrome (SIRS), followed by a compensatory, counterbalancing anti-inflammatory cascade called compensatory anti-inflammatory response syndrome (CARS).11

Post-acute COVID-19 syndrome in the discharged patient is unavoidable. Shortness of breath and fatigue are the most common symptoms. Other symptoms include headache, myalgia, cognitive and mental disorder, hair loss, cough, smell and taste dysfunction, and cardiac and gastrointestinal issues. These symptoms may persist for up to six months. Lung fibrosis is one of the sequelae of pneumonia, some experience severe respiratory failure.8,9 Studies stated early active mobilization is important for improving muscle strength and mobility in a discharged patient to gain a better quality of life.8 Early rehabilitation should be started during the acute phase of the illness. Some studies stated it is not recommended for severely and critically ill patients with progressive deterioration. The timing for beginning rehabilitation should be determined after ruling out all precautions.8,9,11 When the pandemic emerged, nearly all health sectors were involved, and normal rehabilitation protocol was nearly never executed because patients must be discharged earlier than they should be in order to make room and beds available for other patients. This makes patients discharged after COVID-19 may have poor fitness and have breathing difficulties because of muscle wasting, including respiratory and trunk muscles.9

The patient, in this case, reported a complaint of shortness of breath on admission. He felt breathlessness and heavy breathing two days after being discharged from the hospital and got worsening over time. Chest inspection shows incomplete chest expansion and tachypnea patterns. Several medications and physiotherapy were then added to the patient management. We train the patient with breathing exercises and chest physiotherapy techniques.

Breathing exercises have proven to improve chest muscle strength for maximizing inspiration. Good breathing is marked by deep and long inspiration. The inhaled should be through the nose, expanding the abdominal wall, then exhaled through the patient’s mouth with a forced expiratory technique. These techniques intend to make a full chest expansion, strengthen the diaphragm, and improve respiratory muscle efficiency.2,8,9 Chest physiotherapy is effective for sputum clearance; it also helps with chest expansion and strengthens respiratory muscles.2,12 Breathing exercise and chest physiotherapy are considered adjuvant therapy for the inpatient or acute phase but turn out to be the primary therapy for discharged and outpatient.12,13

The patient in this case report was fully alert and able to do all the staff’s instructions. Breathing exercise and chest physiotherapy could be done if the patient can obey the staff’s instructions and has reached clinical stability.13 He showed improvement by oxygen tapered down on the sixteenth day of hospitalization. He used 3 liters of oxygen by nasal cannula, and oxygen saturation was 94%. On the day the twentieth day of hospitalization, oxygen was tapered down to 2 liters per minute and showed 95% of oxygen saturation. On the twenty-fourth day of hospitalization patient’s oxygenation tapered down without non-invasive ventilation (NIV) oxygen, and he could do the exercises by himself, with oxygen saturation recorded persistent at 94%-95%. He was discharged after 27 days of hospitalization.

The limitation of this study is rehabilitation intervention is still influenced by many factors such as medical interventions and NIV therapy. A further superior study design is needed to obtain more research findings and better results.

CONCLUSION

This case report has given a case of a post-acute COVID-19 syndrome patient presented in a 57-year-old male with shortness of breath and cough. The patient was then given breathing exercises and chest physiotherapy in order to improve respiratory muscle strength and chest expansion in order to improve oxygen perfusion. Those exercises show improvement in our patients on the seventh day of treatment.

CONFLICT OF INTEREST

The authors declare that there is no competing interest regarding the manuscript.

FUNDING

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AUTHOR CONTRIBUTION

All the authors equally contributed to the study, from the conceptual framework, data gathering, and analysis to interpreting the study results.

ETHICS CONSIDERATION

The patient in this study has understood and agreed to the use of his personal medical record related to this writing of scientific articles. The patient consciously gave informed consent regarding the data obtained for the preparation of the article to be published in scientific journals.

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