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COVID-19 and pulmonary rehabilitation

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Abstract:

The aim of pulmonary rehabilitation (PR) in coronavirus disease-19 patients is to relieve dyspnea, anxiety, and depression; maximize functional capacity; and improve the quality of life. PR should be planned through careful determination of disease phase, patient-related factors (age, obesity, comorbidities, and complications), exercise timing and intensity, and applicable methods. For training patients, the primary method of choice should be respiration videos, booklets, or remote consultations. In cases of close contact, both the patient and the physiotherapist should take necessary precautions due to the risk of infection.

Keywords:

Acute respiratory distress syndrome, COVID-19, pneumonia, pulmonary rehabilitation, severe acute respiratory syndrome coronavirus 2

Introduction

Severe acute respiratory syndrome coronavirus 2 is a new coronavirus that emerged in 2019. The disease caused by this virus was referred to as coronavirus disease-2019 (COVID-19) by the World Health Organization.^[1] This infection is extremely contagious. Human-to-human transmission occurs 2–10 days before the onset of disease symptoms.^[2] Among the infected, the disease is mild or asymptomatic in 80% and severe in 15% (requiring oxygen therapy). The remaining 5% experience a very severe disease that requires respiratory and life support. The mortality is 3%–5%, however, it is fatal in individuals with advanced age and comorbidities. Depending on the immune system response, COVID-19 may be asymptomatic, but it may also lead to acute respiratory distress syndrome (ARDS),

sepsis, shock, and death.^[1,3] Advanced age, male gender, at least one comorbidity, higher disease severity scores, elevated D-dimer levels, and lymphopenia cause a high risk for severe COVID-19 that requires hospitalization and/or intensive care support.^[4,5]

Fever (89%) and dry cough (68%) are the most frequent symptoms. Less frequently, fatigue (38%), expectoration (34%), and shortness of breath (19%) may occur. Patients may also present with generalized muscle pain.^[6]

Pulmonary changes are estimated to result from a localized and systemic immune response caused by a hyperinflammatory state.^[7] There is bilateral diffuse alveolar injury pathologically characterized by cellular fibromyxoid exudate.^[8] Cytokine storm is a result of severe immune reaction in the lungs. Intrapulmonary shunt caused by pneumonia or ARDS results in hypoxemia. Thus, it is very important to ensure the

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oxygenation of the patient optimally. Oxygen masks are enough for mild cases, while severe cases require intubation and invasive mechanical ventilation (IMV).^[9] China and Italy are using early intubation and IMV,^[10] while Turkey mostly uses high-flow oxygen.

Pulmonary Rehabilitation in COVID-19

National guidelines published by now have focused primarily on diagnosis, isolation methods, and medical treatment. No definition or application method has been mentioned in terms of pulmonary rehabilitation (PR).^[11] Recommendations from China, Italy, and Austria refer to applications specific to PR.^[12-14] In Turkey, the recommendations published individually by the Turkish Physiotherapy Association^[15] and the Turkish Society of Physical Medicine and Rehabilitation^[16] have not suggested PR in mild disease and mild pneumonia periods like international studies.

For hospitalized patients due to COVID-19, the aim of PR is to relieve dyspnea, anxiety, and depression; maximize functional capacity; and improve quality of life. The early initiation of PR is not recommended for patients who are not stable or getting worse, have severe and critical disease settings. For isolated patients, in turn, it is recommended using breathing videos, booklets, or remote consultations as the primary method of training patients in respiration rehabilitation.^[17]

PR should be planned considering the disease phase, patient's age, obesity status, comorbidities, and other complications. The patient's consciousness level, respiratory, cardiological and motor functions, and quality of life should be evaluated, and medical support should be provided for anxiety and depression.^[13,17,18]

Mild COVID-19 Cases

The choice of the proper mask is important to ensure sufficient oxygenation of the patient. The Venturi masks (if available) help with delivering the desired FiO_2 of oxygen to the patient in such cases. Yet, it should be careful because prolonged inhalation with this mask may lead to oxygen toxicity and ARDS. If there is a need to deliver a high amount of oxygen, a valved nonbreathing mask can be preferred. For patients with acute hypoxemia, a mask with a reservoir bag can provide the delivery of oxygen at a flow rate of 10–15 l/min. Depending on the general status, oxygen delivery with a high-flow nasal mask, continuous positive airway pressure, and noninvasive ventilation (must be used with a protective filter) can be performed.^[14]

Patients with generalized muscle pain and fatigue should get into motility slowly following the improvement of

general status with medical treatment. Such patients can do low-intensity exercise on their own. When they are discharged, it will help them regain their muscle strength by walking inside the room, doing arm and leg exercises in the sitting position, and slight squat exercises in the standing position with frequent room ventilation at their home while they are in isolation. Proper nutrition and a sleeping pattern will also accelerate their recovery.^[13,16] It will be appropriate to give these patients videos and printed booklets on training and exercise samples and to do online interviews during and after the treatment.

COVID-19 cases with mild pneumonia

For these patients, only positioning is recommended to drain the increased secretion occurring together with comorbidities, instead of classic chest physiotherapy methods. The recommendation can be lying and sitting in modified positions to drain the lobes of their lungs. When the infection period is over and the patient is stable, patients are given training through videos and booklets related to training and exercise to improve their mobility after leaving the hospital. Online interviews will reduce the anxiety of these patients. Breathing exercises applicable again during this period should be done after the risk of infection is over and while the patient is wearing a surgical mask.

COVID-19 cases with moderate-to-severe pneumonia

These patients require intensive care monitoring. PR can be initiated after the samples to be taken at day 14 of the infection period and 48 h afterward are tested COVID-19 negative, and the patient is systemically stable and transferred to the service. This time, however, may extend more based on recent publications. COVID-19 positivity was re-established in recovered cases reported from China.^[19] ARDS that occurs in COVID-19 is not similar to the bacterial ARDS and has a more severe course. There is also severe cardiac, neurological, and muscle involvement. A published study reported a severe muscle breakdown and a very high level of CK, accompanied by severe hepatic and renal failure.^[20] These patients, who are receiving prophylaxis for pulmonary thromboembolism or deep vein thromboembolism, are also at risk for bleeding due to anticoagulant therapy or disseminated intravascular coagulation.^[21]

Initiating an intensive care patient with an early rehabilitation without a stable general status may bring along serious risks. This is because of the unknown effect of the cardiac load and muscle breakdown associated with COVID-19, and the effect of such load on the liver and kidneys.^[20,21] There are no long-term mortality and morbidity data yet for cases with ARDS due to COVID-19. Nevertheless, the lung functions will be restricted by the pulmonary fibrosis that occurs in most

patients. Prone position will be beneficial for secretion drainage and oxygenation improvement of the patient in this period.^[11-14,21] The Cochrane study has reported that there is not enough data with a high level of evidence suggesting that early rehabilitation improves functional status among ARDS patients.^[22] Accordingly, there is also no data with a high level of evidence, which will support PR for COVID-19 cases. Nevertheless, PR will be beneficial in terms of facilitating participation in daily life activities among patients developing pulmonary fibrosis in the following periods.^[23]

It is appropriate to make the planning considering advantages/disadvantages for the patient due to the risk of infecting practitioners during the stay in intensive care. A risky presentation occurs when the increased cardiac load during ARDS is combined with cardiac injury due to COVID-19. The waste load caused by muscle breakdown and coagulopathy during the process will also bring additional problems. Therefore, PR should be planned by carefully determining exercise intensity, timing, and applicable methods. An additional burden should not be added with exercise when the patient is fighting against the disease. After the risk of infection is over, it can be started with positioning, active-passive range of motion exercises for joints, followed by sitting inside and on the edge of the bed, doing active-passive range of motion exercises while sitting on the edge of the bed. The patient should be advised to do breathing exercises while wearing a face mask.

A pneumatic compression device can be intermittently used on immobile patients to avoid thrombosis. As long as the patient is immobile, compression stocking is recommended.

It is important that the physiotherapist that will perform the exercising practice act following the personal protective equipment donning and doffing instructions by the Ministry of Health^[11] and practice while wearing filtering facepiece (FFP) 2 and FFP3 (N95 and N98) masks.

Conclusion

There is a fight against a disease that has never been encountered before. Prognosis of the disease is learned by living through and experiencing it. It is very important to conduct every application with maximum care and protection during the fight against an unknown. Available guidelines have a low level of evidence. Further evidence is required in this field.

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Conflicts of interest

There are no conflicts of interest.

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