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What about rehabilitation medicine after COVID-19

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Abstract

The SARS-CoV-2 virus has taken the medical world by surprise in 2020 by determining the COVID-19 pandemic. This disease affects the respiratory tract in most cases, although cardiac and digestive tract involvement are not uncommon, thus making COVID-19 a disease of the whole body.

Facing this threat, the doctors' attention shifted towards prevention and the reorganization of the whole medical system to combat this threat and also towards finding the most appropriate medical treatment. To date, the disease has reached its peak in some countries and medical rehabilitation can show its valuable role in reintegrating those affected or those that are healing back into society.

Among those that can benefit from rehabilitation programs are those that were quarantined or in self-isolation and also healthcare professionals that deal with COVID-19 and are predisposed to the burnout syndrome.

The types of rehabilitation that capture our attention are those that deal with respiratory, mental health and neuromotor recovery. Also, balneotherapy programs can have a healthful effect in the current context. Nevertheless, maintaining close relations with loved ones through technology, special positioning exercises and physical therapy for those admitted in wards are also rehabilitation techniques that are being studied in the present context.

To sum up, medical rehabilitation is the key for regaining a normal life after being diagnosed with COVID-19 and thereafter.

Keywords: COVID-19 disease, post-pandemic, cardiopulmonary rehabilitation, mental health rehabilitation.

Introduction

At the end of 2019, the city of Wuhan in the Chinese province of Hubei had witnessed the emergence of a new type of pneumonia of unknown etiology (Hongzhou Lu et al., 2020). The culprit pathogen was a new type of coronavirus which was later renamed SARS-CoV-2 by the World Health Organization and subsequent infection with it causes COVID-19 disease (1). The province of Hubei is a densely populated area having a total population of 58 million residents as of 2010, with Wuhan being its largest city, and also its capital (2). Initially, the first 27 cases were linked to Huanan market, a place where a large variety of animals including fish, bats, poultry and others are being sold (Guo et al., 2020).

This combination between a densely populated area and a place that sells bats which are a natural reservoir of the new SARS-CoV-2 has led to the rapid spread of this new pathogen at first locally and then globally. It is considered that the first interhuman transmission took place in the middle of December 2019 (Guo et al., 2020; Li et al., 2020).

To date, we know that these viruses can cause a number of infections in various animals and more notably respiratory tract infections in humans, such as severe acute respiratory syndrome (SARS) in 2003 and Middle East respiratory syndrome (MERS) (Yin et al., 2018; Drosten et al., 2003; Zaki et al., 2012).

Overview of SARS-CoV-2 infection

While most patients that became infected developed symptoms such as fever, cough, shortness of breath, some progressed to more severe diseases such as acute respiratory distress syndrome or ARDS which led to multiple organ failure or even death in some patients. The vast majority of these new cases had an epidemiological link to Huanan market, many victims declaring that they worked or shopped there. The incubation period varies between 0 and 24 days, averaging 6.4 days, while the mean duration until the onset of symptoms is 5.2 days (Chen et al., 2020; Li et al., 2 020).

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One of the largest epidemiologic studies on the SARS-CoV-2 virus stated that among 44,642 confirmed cases, 80.9% had mild pneumonia, similar to community acquired pneumonia, 13.8% were severe cases, while 4.7% were critically ill (***, 2020).

Currently, the death rates differ between the various countries that are struck by the illness, with high numbers occurring even in some highly developed nations such as the UK (14.14%). While some Chinese data reveal a mortality rate of 2-3% among those affected, as of 26.05.2020 the calculated global death rate has been 6.29% of the total number of confirmed COVID-19 cases (***, 2020; Roser et al., 2020).

Taking into account the situation determined by the new virus, until a vaccine is discovered, all attention is directed towards finding the best and most effective medical treatment.

Typical features of the 2019 coronavirus disease

The first autopsies conducted in China revealed pulmonary modifications similar to those previously encountered in the SARS epidemic of the Middle East, such as diffuse alveolar pneumonia and the presence of fibro-myxoid cellular exudates. Although the main encountered diagnosis was interstitial pneumonia, pulmonary microthrombosis and peripheral pulmonary hemorrhages were also detected (Xu et al., 2020; Buja et al., 2020).

Furthermore, autopsies conducted on COVID-19 patients in the US have outlined that the major pathologies leading to death were those linked to respiratory and cardiac failure and also the hypercoagulable state (Buja et al., 2020). Affected patients are at risk of developing venous thromboembolic disease and pulmonary embolism, and a new hypothesis of inflammatory microthrombosis has been lately advanced. One such study has shown a 31% incidence of thrombotic events in patients diagnosed with COVID-19 admitted to intensive care units (Ciceri et al., 2020; Klok et al., 2020; Danzi et al., 2020). The curious aspect is that patients with no known or prior major risk factors for thrombosis are being diagnosed with pulmonary embolism whilst also positive for the virus; therefore, we can understand the need for prophylactic anticoagulants in COVID-19 patients (Danzi et al., 2020; Bikdeli et al., 2020; Tang et al., 2020).

Even if cardiac involvement is often found in a lot of registries dealing with COVID-19 patients, we have to take into consideration the fact that many patients had prior cardiac issues (Clerkin et al., 2020). More often we see that viral myocarditis is found and many case studies have been presented lately (Zeng et al., 2020; Kim et al., 2020; Inciardi et al., 2020). Heart biopsy studies in these patients revealed diffuse myocardial inflammation and viral particles were found in interstitial cells of the myocardium (Inciardi et al., 2020; Tavazzi et al., 2020). For instance, one study in China on 416 patients showed that cardiac involvement was present in 19.7% of cases, being confirmed by the increase in cardiac specific biomarkers such as CK-MB, myoglobin, and highly sensitive troponin I (Shi et al., 2020).

Medical treatment in COVID-19

Having to deal with this new situation created by the virus, until a vaccine is discovered, all attention has shifted towards discovering the optimal and most effective medical treatment. At the beginning of the pandemic, in China, the disease was treated empirically using drugs such as hydroxychloroquine, remdesivir, favipiravir, umifenovir, alpha-interferon, after which clinical trials were started to test their efficacy. Previously, remdesivir was used for treating HIV, alpha-interferon for hepatitis, hydroxychloroquine is an antimalarial agent, and drugs like umifenovir and favipiravir were used for treating flu (Dong et al., 2020).

The clinical trials that were conducted did not match in vitro studies and thus, multiple changes in drug guidelines were seen. We should not neglect the adverse effects that some of these drugs have, such as anemia, hypoglycemia, QT-interval lengthening, retinopathy requiring individual adaptation of the drug scheme in every patient with COVID-19 (Sanders et al., 2020; Touret & de Lamballerie, 2020).

Currently, a couple of months away from the first case of SARS-CoV-2, the treatment guidelines include antithrombotic therapy and immunotherapy in combination with other drugs used at the beginning such as hydroxychloroquine and remdesivir (3). Until now, there is no known treatment that can cure COVID-19, only drugs that are capable of reducing the harmful effects of the virus while helping the immune system fight the disease (4).

The role of rehabilitation in the context of the COVID-19 pandemic

Since WHO declared COVID-19 a pandemic, most efforts have been guided towards limiting the spread of the disease and preventing hospitals from being crowded, some countries being overwhelmed by the high number of people diagnosed with the virus (5). For instance, Italy used its intensive care units at maximum capacity in an effort to treat patients with severe forms of the disease (Remuzzi et al., 2020).

Regarding medical rehabilitation, the prevention of COVID-19 can consist of moving medical services from large centers towards a home-based medical rehabilitation service, disinfecting all physiotherapy equipment, or even using sterile, antimicrobial gels while performing muscle and tissue ultrasound (Koh & Hoenig, 2020).

Although prevention is an important aspect of care, we should not overlook the situation of patients that are in the process of healing or even quarantined because of the virus. Stepping up their rehabilitation process psychically but most importantly from a respiratory and musculoskeletal standpoint could also positively impact society as a whole.

In northern Italy, while trying to improve their strategy against COVID-19, doctors and physiotherapists have reorganized. As such, the cardiopulmonary rehabilitation wards have been converted into care units for patients that are past the acute phase of the disease but still have in most of the cases remnants of interstitial pneumonia. After restructuring, the rehabilitation ward takes care of the following: oxygen monitoring and therapy, non-invasive

ventilation such as CPAP, positional maneuvers for enhancing ventilation, reconditioning physical therapy of light and moderate intensity together with initial and final testing of respiratory and motor functions. Such a program could help create new and targeted protocols for the rehabilitation of COVID-19 positive patients (Simonelli et al., 2020).

After reaching the so-called peak of the pandemic, society starts to also become aware of the economic impact of this disease. Each month during the COVID-19 pandemic can lead to a decrease in national GDP of up to 2.5-3%. Some state that the forthcoming economic crisis is the second big critical point after the health crisis generated by the disease (Fernandez, 2020).

Means of rehabilitating patients with COVID-19. Mental health rehabilitation

Fundamentally, medical rehabilitation is a key aspect as it can positively influence society by accelerating the reintegration process of those that are healed or in the process of healing and even for those that are being quarantined or in self-isolation. This aspect was also observed in the past during the SARS epidemic in 2003, where it was demonstrated that supervised physical therapy exercises improved the cardiorespiratory and musculoskeletal functions of those affected (Lau et al., 2005).

Concurrently, psychic rehabilitation could improve outcomes given the fact that mental health issues are rising among patients and healthcare workers dealing with COVID-19 (Khan et al., 2020; Mazza et al., 2020). Undoubtedly, patients with multiple comorbidities are at high risk for developing depression and anxiety, but we should not forget the healthcare staff facing the same issues. One study conducted among medical personnel in China dealing with COVID-19 patients showed that out of 1257 subjects, 634 (50.4%) manifested depressive symptoms, 540 (44.6%) had symptoms of anxiety, while most were affected by stress-related issues (899 or 71.5%) (Lai et al., 2020). That being said, the most important aspect of psychic rehabilitation is the regaining of social interaction and interpersonal relation skills.

One simple and safe way to socially interact in these new circumstances is by using the telephone or internet and social networks. However, a very long time spent on the telephone could have negative consequences by increasing our dependence on such devices. Another method of loosening up the atmosphere when in self-isolation or when admitted to the hospital is by using humor such as jokes, magazines and comedy shows that are encouraged to boost the morale of patients. Likewise, telephone counseling between patient and therapist can also be facilitated (Chaturvedi et al., 2020).

Respiratory rehabilitation

The rehabilitation of the respiratory system can be utilized especially for patients presenting with severe forms of COVID-19 associated pneumonia usually requiring admission to intensive care units (Kiekens et al., 2020). Out of all patients positively diagnosed with COVID-19, 15% usually have life threatening forms of the disease and 42% require oxygen supplementation. In the case of serious complications, patients are usually mechanically ventilated and in most cases they are bedridden. Physical therapy exercises that stimulate mucociliary clearance such as gravity assisted drainage positions and using active respirations as well as percussion or vibration techniques are recommended for patients that have a productive cough. Despite the fact that productive cough is not a common symptom of COVID-19, it is present in patients who have other comorbidities such as neuromuscular disease, cystic fibrosis or COPD. The majority of patients with mild forms of COVID-19 related disease have dry cough. In this case, rehabilitation maneuvers that stimulate coughing are strictly prohibited. Also, a series of precautions should be taken into consideration for increasing the safety of the staff and other patients in COVID-19 designated care units. Among these, the following can be mentioned: keeping a safe distance from the patient, wearing protective equipment, using individual rooms for patients, instructing patients with productive cough to minimize the aerosols generated when they cough by using face masks or single use tissues (Thomas et al., 2020).

One study that included 72 old patients diagnosed with COVID-19 has shown a considerable improvement of respiratory function after only 6 weeks of rehabilitation programs (Liu et al., 2020).

Neuromotor rehabilitation

Another branch of physical and rehabilitation medicine that could be used in COVID-19 patients is that of neuromuscular function recovery. Due to prolonged immobilization, sedation or after the use of muscle relaxants in order to facilitate ventilation, patients can develop muscle weakness or even atrophy during hospitalization, as shown in studies performed on critically ill patients (Koukourikos et al., 2014).

Exercises that facilitate mobilization in bedridden patients, active workouts done with the help of a physiotherapist, and even balance increasing movements can be helpful to those kinds of disabled patients. Among patients benefiting from a respiratory rehabilitation program, an improvement in numerous parameters can be seen: FEV1(L), FVC(L), FEV1/FVC%, DLCO% and also the six minute walk test (Liu et al., 2020).

Balneotherapy in COVID-19 patients

For those cured of COVID-19 and having suffered from the effects of deconditioning, as well as for those enduring a high degree of stress while in self-isolation or while respecting the social distancing measures, balneary treatments can have a positive effect and should be taken into consideration. The staff in dedicated COVID-19 units that are predisposed to burnout can also benefit from balneotherapy to regain their well-being. One such study shows a considerable improvement in health for those suffering from burnout after 3 weeks of balneotherapy (Xu et al., 2013; Matsumoto, 2018; Dubois et al., 2010; Rapoliene et al., 2016; Blasche et al., 2010; Segers, 2020).

In balneotherapy dedicated facilities, patients can benefit from walking sessions or other forms of open-air physical activity and they can also be aided by the favorable mountain climate and the healthful effects of thalassotherapy.

Conclusions

1. Prevention is key for combating the spread of a virus during a pandemic.

2. A solid rehabilitation program could be the essence in regaining a normal life after being diagnosed with COVID-19.

3. Psychic, motor, and respiratory rehabilitation techniques can be beneficial in wards that deal with COVID-19 both for treating patients and for maintaining the mental health of the staff.

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