Features of Rehabilitation Therapeutic Treatment of Patients who have come through Coronavirus Disease

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Authors’ contributions
This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT
The purpose of the article is to consider the features of restorative therapeutic treatment of patients who have suffered a coronavirus infection. This disease can cause respiratory, physical and psychological dysfunction in patients. Therefore, restorative therapeutic treatment and rehabilitation are critical for both hospitalized and discharged patients with COVID-19.

The author believes that many patients who have a history of a previous coronavirus infection note that they experience various unpleasant symptoms even six months after receiving negative tests. So, such patients may experience weakness, shortness of breath, tachycardia, instability of mental states, and so on. At the same time, against the background of an active fight against the
spread of COVID-19, measures related to the rehabilitation of convalescents are receding into the background, which is fundamentally wrong. The paper analyzes the literature devoted to the problem of rehabilitation treatment after a coronavirus infection, and also applies comparative and comparative research methods. The author concludes that complications after COVID-19 can significantly worsen the quality of life of patients. For this reason, specialists need to identify the degree and level of complications and patients who have suffered a coronavirus infection as early as possible in order to prescribe appropriate medication or physiotherapy.

Keywords: COVID-19; respiratory; physical; psychological dysfunction; restorative therapeutic treatment; rehabilitation.

1. INTRODUCTION

The need for restorative treatment after any disease is recognized by all medical professionals in the world. However, the level of such treatment also depends on the seriousness of the disease, as well as on the likely complications that may occur during the recovery stage.

Coronavirus disease, which has been "walking" around the world for almost a year and a half, is a highly virulent and dangerous disease that cannot only lead to severe lung damage or even death, but also cause a number of complications that can reduce the quality of life of the patient.

Thus, COVID-19 disease is characterized by an interaction between hyperactive coagulation and complement systems caused by hyperinflammatory conditions, which leads to a prothrombotic state and diffuse tissue damage. In addition, complications can affect almost all organs and systems of the body, especially if a person has concomitant diseases or reduced immunity [1].

Today, doctors around the world are making significant efforts to minimize the consequences of coronavirus infection and improve the quality of life of people who have suffered it. The aim of the work is to consider the features of restorative therapeutic treatment of patients who have suffered a coronavirus disease.

2. RESEARCH METHODS

The paper analyzes the literature devoted to the problem of rehabilitation treatment after a coronavirus infection, and also applies comparative research method.

2.1 Empirical Review

For COVID-19 recovered, the recovery process remains difficult, with many facing severe target organ damage, neurocognitive deficits, malnutrition and dysphagia, physical weakness, anxiety, depression, and other consequences that may require lengthy hospitalizations and ongoing post-hospitalization rehabilitation. Prolonged illness and recovery time from COVID-19, combined with infection prevention measures that make it difficult or contraindicated to visit relatives on-site or off-site, exacerbate social isolation and loneliness, which are known to increase the risk of dementia, cause cognitive decline, provoke poor psychiatric outcomes, and can contribute to premature death from all causes. Moreover, the course of COVID-19 disease includes many symptoms, including myalgia, arthralgia, malaise and weakness; therefore, therapeutic methods that help relieve these symptoms and help patients cope with changes in functional status are particularly desirable. While patients can benefit from a comprehensive approach to COVID-19 control, it is generally not always available in inpatient condition due to insufficient access to integrated health care providers and suboptimal resources, especially during the COVID-19 pandemic [2].

Thus, in patients who have suffered a coronavirus infection, there are a number of complications of various types. Fatigue was observed in 28-87% of people after infecting with coronavirus. This complication was observed in both hospitalized and non-hospitalized patients, as well as in patients admitted to hospitals and intensive care units. The authors evaluated the relationship between fatigue and the severity of COVID-19, and as a result, it was determined that greater fatigue was observed both in seriously ill patients and in those patients who spent a long time in the hospital. At the same
time, fatigue was most often observed in women and in people with psychological problems [3].

In most studies, the prevalence of myalgia after COVID-19 was 4.5–36%, and the prevalence of arthralgia after COVID-19 was 6.0–27%. Overall, pain was reported by a larger percentage of people recovering from COVID-19 who had a severe acute illness and were referred for hospitalization. Most people with anxiety and depression reported symptoms of musculoskeletal disorders.

The state of physical health of patients who had suffered a coronavirus infection was most often assessed by researchers using quality of life questionnaires. According to the results of the study, the authors concluded that physical activity, mobility and normal activity decreased in 15-54% of people after infection with the coronavirus. There was also a decrease in physical activity in individuals who were treated in the intensive care unit. Three studies reported a greater reduction in physical role functioning (participation in life despite physical limitations) compared to other components of physical health.

The most common symptom of a mental health disorder, according to experts, was anxiety, with prevalence after COVID-19 of 6.5% to 63%. The second most common psychological symptom was depression with a prevalence of 4% to 31% in the follow-up period exceeding 1 month after COVID-19 [4].

The other common mental health problem after COVID-19 was post-traumatic stress disorder, with a prevalence of 12.1% to 46.9%. The severity of COVID-19 was associated with the severity and prevalence of symptoms of a mental health disorder, with anxiety and post-traumatic stress disorder significantly more common in patients placed in the intensive care unit.

Additional symptoms of mental health disorders were sleep problems, with a prevalence of 17.7% to 30.8%, and cognitive-functional problems reported in 17.1% to 4.4% of people who had COVID-19, especially those who had been treated with intensive care. Neurocognitive parameters, including immediate verbal memory and semantic fluency, were moderately impaired in 58.7% and severely impaired in 18.4% of COVID-19 patients. More than half of the patients had at least one stress-related symptom (anxiety, depression, and post-traumatic stress disorder) or neurocognitive disorder [5].

It was also noted that people without a previously diagnosed mental health condition (74%) reported symptoms of anxiety and depression after COVID-19.

2.2 Conceptual Framework

The reasons for the neurological manifestations, according to a number of authors, are that the infectious agent COVID-19, SARS-CoV-2, has a high affinity for the human angiotensin converting enzyme 2 (ACE2) receptor. This receptor is also expressed in neurons and glial cells, which may explain reported neurological manifestations such as olfactory neuropathy (anosmia), peripheral neuropathy, and brain diseases. In postmortem studies, viral particles were found in the cerebrospinal fluid and cytoplasm of neocortical and hypothalamic neurons, and neuronal degeneration and necrosis, edema, cell hyperplasia, and cellular infiltrates were also detected. A study in mice showed that the pathway of SARS-CoV-2 in the central nervous system passes through the olfactory bulb, spreads to other adjacent areas, and causes severe perivascular inflammation and meningitis [6].

It has been suggested that in cured patients, SARS-CoV-2 remains latent in the central nervous system for a long time, being able to reactivate and cause neurological complications. Currently, post-COVID syndrome may include symptoms associated with residual inflammation, organ damage, effects on pre-existing health conditions, or non-specific effects due to hospitalization or prolonged ventilation (post-intensive care syndrome). In this sense, it is appropriate to pay attention to new studies aimed at evaluating prognostic markers, such as markers of inflammation in peripheral blood, such as the ratio of neutrophils to lymphocytes, C-reactive protein, D-dimer, or serum ferritin, which seek to predict morbidity and mortality.

The most common neurological manifestations are anosmia, auresia, and headache. However, case series and observational studies show data on a large number of patients who develop cerebral circulatory disorders (CVD), Guillain-Barre syndrome (GBS), de novo status epilepsy, and encephalopathy. Neurological complications with severe consequences are a reason for immediate rehabilitation, the purpose of which is an attempt to restore the lost functional ability [7]. Since COVID-19 is a multisystem disease that significantly affects organs such as the lungs and heart, the rehabilitation process is not equivalent
compared to other groups of patients who develop neurological complications for other reasons, so the neurorehabilitation approach should be comprehensive.

A person's mental health is the most important factor that ensures their ability to work and quality of life, for this reason, the statistics of the pandemic emphasizes the need for careful and continuous monitoring of all patients with COVID-19, even if they are considered asymptomatic, with regular screening for possible long-term persistent neurological consequences [8].

All of the above has led to the need for specialists to find ways of therapeutic treatment and rehabilitation of patients who have suffered a coronavirus infection.

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3. DISCUSSION

One of the areas of rehabilitation treatment after a coronavirus infection is pulmonary rehabilitation. Pulmonary rehabilitation is the individualized rehabilitation treatment of patients with chronic lung diseases after a detailed assessment. Exercise-based pulmonary rehabilitation includes comprehensive interventions, including, but not limited to, psychological and nutritional support, as well as training and behavioral changes.

The goal of pulmonary rehabilitation is not only to improve the physical and mental state of the patient, but also to help him/her quickly return to his/her family and society. Studies have shown that after discharge, patients with severe acute respiratory syndrome (SARS) may still suffer from symptoms such as restrictive pulmonary dysfunction, palpitations, hand tremors, and shortness of breath during exercise, which affect their daily activities and worsen their well-being, quality of life [9].

It has been suggested that these symptoms are associated with prolonged bed rest, side effects of steroid medications, and residual pathological changes such as atelectasis, persistent alveolitis, pulmonary fibrosis, and muscle weakness or dysfunction of varying degrees. In addition, a year-long follow-up of SARS patients showed that SARS survivors show persistent functional disability one year after discharge from the intensive care unit.

Most patients suffer from extrapulmonary conditions, the most pronounced of which are muscle exhaustion and weakness. Pathological changes, such as pulmonary fibrosis, were not dominant in patients with COVID-19; however, it can be assumed that damage to the lungs and other organ systems caused by SARS-CoV-2, especially in severe SARS patients, can lead to residual physical dysfunction of varying degrees. Thus, data on the pulmonary rehabilitation of patients with SARS are a convincing support and guide for the development of pulmonary rehabilitation programs for patients with COVID-19 [10].

3.1 Respiratory Rehabilitation for Patients with COVID-19

Based on the opinions and recommendations of leading experts, rehabilitation specialists in China have developed practical and feasible recommendations for respiratory rehabilitation for patients with COVID-19. The main instructions in this manual are as follows:

1) The short-term goal of pulmonary rehabilitation is to relieve shortness of breath and relieve anxiety and depression, and the long-term goal is to preserve the patient's function as much as possible, improve person's quality of life, and promote the person's return to society.

2) Before starting the rehabilitation program, a comprehensive assessment should be carried out. For example, clinical risk assessment and exercise risk assessment should be based on the patient's clinical symptoms, basic vital signs, additional examinations, images, comorbidities, contraindications, etc., while quality of life, daily endurance activity, as well as psychological and nutritional assessments should be conducted in the form of questionnaires [11].

The results of these assessments can then be combined with the patient's aerobic endurance, muscle strength, balance, and flexibility to formulate an individual and progressive rehabilitation prescription. The content of the recipe mainly includes:

A) Aerobic exercise: walking, brisk walking, jogging, swimming, etc., starting with low intensity and gradually improving the intensity and duration, 3-5 times a week, each time for 20-30 minutes.
B) Strength training: Progressive weight training is recommended. The training load of each target muscle group is 8-12 RM 1-3 groups / time. The training interval of each group is 2 minutes, 2-3 times a week, and the training load increases by 5-10% every week.

C) Balance Training: Patients with balance dysfunction should be involved in balance training, including unarmed balance training and instrument balance training.

D) Respiratory training: If the patient has symptoms such as shortness of breath, wheezing, and difficulty expelling sputum after discharge, respiratory training such as body position control, respiratory rhythm adjustment, respiratory muscle group stretching exercises, and cough training should be organized in conjunction with the evaluation results.

E) Medical training in the use of traditional Chinese medicine: these are mainly light and ordinary patients, as well as discharged patients. If there are no contraindications (for example, limb dysfunction and impaired consciousness), it is recommended to perform Baduan jin, Twenty-four simplified tai chi, Six-word qigong, etc. 30-50 minutes each time, once a day.

3) All rehabilitation must be carried out in compliance with safety requirements. If the patient has peripheral capillary oxygen saturation (SpO2) <88% or develops symptoms such as palpitations, sweating, chest tightness and shortness of breath that the doctor considers unsuitable for rehabilitation, then the rehabilitation program should be discontinued immediately.

4) In mild and moderate cases, rehabilitation interventions should be carried out as early as possible. On the contrary, in severe and critical cases, priority should be given to life-saving measures when the patient's condition is unstable or the disease is still progressing. In such cases, pulmonary rehabilitation interventions should be administered only after the patient's condition has stabilized. In addition, from the point of view of safety and human resources, the movement of seriously ill or critical patients should be limited to their bed or bedside.

5) Compared to the general rehabilitation of patients with chronic diseases, the most distinctive characteristic of the rehabilitation of patients with COVID-19 is the infectivity of the disease. Therefore, operations that may increase the risk of infection, such as instructive coughing, exhalation training, and tracheal compression, should be minimized. During expectoration, you should cover your mouth with a closed plastic bag to prevent infection. In addition, the pulmonary rehabilitation of patients with COVID-19 should be conducted primarily through training videos, brochures, remote consultations, or online training to save on protective equipment and avoid cross-infection [12].

Plasma therapy for convalescents is recommended as an additional treatment for COVID-19. This approach has been used in Ebola, Middle East respiratory syndrome (MERS), and severe acute respiratory coronavirus (SARS-CoV) infections, and several studies have shown promising results. Convalescent plasma therapy reduces viral load, prevents cytokine response, and reduces mortality. In addition, CP therapy also works by transferring antibodies of a specific infectious agent from survivors to patients infected with the same pathogen. This form of passive immunity helps the patient immediately fight the exacerbation of the disease. Plasma therapy has been used in a small population of patients with clinically severe COVID-19, and promising results have been observed in this population [13].

However, the use and preparation of convalescent plasma for the treatment of COVID-19 must be controlled by the Ministry of Health and comply with the legal principles and ethics of human research applicable to COVID-19. The use of convalescent plasma must comply with ethical principles of autonomy, such as voluntary, informed consent and confidentiality. It is also necessary to consider the risk-benefit ratio for potential recipient donors in order to comply with the principles of charity and non-harm. The principle of equity should also apply to both donors and recipients of donors and medical professionals, for example, when determining the priority of recipients of donors [14].

4. CONCLUSION
Rehabilitation and rehabilitation treatment after COVID has demonstrated the potential to
improve the health of patients, but the mass treatment required in this case has a number of limitations. At present, social distancing is still necessary, which makes it impossible to expand the scope of rehabilitation services for those in need. For a long time to come, the opportunities for classes in the rehabilitation program will be limited by measures of social distancing and infection prevention. This will require specialists to be flexible in the designing and implementing of rehabilitation programs. It is important to take into account the uncertainty associated with the long-term effects expected from COVID-19, and specialists may need to adapt using various innovative methods, such as telemedicine.

The need for COVID-19 rehabilitation programs is obvious: 25% of all patients admitted to hospitals need it. This presents a major challenge for medical professionals providing rehabilitation, which will continue once the burden on emergency services has eased. In order to meet the needs of people for rehabilitation treatment, it is necessary to develop and implement recovery programs after COVID-19.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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