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Effect and enlightenment of rehabilitation medicine in COVID-19 management

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Abstract

Corona virus disease 2019 (COVID-19) is a new disease characterized by lung damage and involvement in multiple tissues and organs in the whole body. Some of the patients may have long-term impairment and dysfunctions, including pulmonary fibrosis, heart, liver, kidney, nerve and immune system. Rehabilitation has certain beneficial effect in the acute stage, and especially in the recovery stage, including improving respiratory function, exercise endurance, self-care in daily living activities, as well as psychological support, etc. Rehabilitation is not offside or absent. A reasonable rehabilitation program needs scientific research to avoid arbitrary conclusions.

Key words

Corona virus disease 2019 (COVID-19); Rehabilitation

At present, our battle against corona virus disease 2019 (COVID-19) has entered a new phase. In China, the number of new cases has been decreasing significantly for weeks and a large number of patients discharged from hospital; the mortality rate of patients with severe and critical symptoms has decreased significantly, and the number of patients turning into mild cases has continued to increase^[1-2]. However, we have noticed that many patients with COVID-19, especially those with severe symptoms, were still unable to take care of themselves and return to normal life and work when discharged. At the same time, the number of new cases in North America and Europe increase rapidly and will soon become new outbreak centers. In 2016, WHO proposed that, in addition to the two clinical outcome indicators of cure and death, a third clinical outcome indicator-functioning was added. All diseases that cannot be completely cured

are accompanied by dysfunction. Functional improvement is a key sign of medical effectiveness and a key sign of health. Rehabilitation is a discipline that aims at improving function, and it is one of the anchors for the medical system of prevention, treatment and rehabilitation in China. How to bring rehabilitation into full play in the treatment of COVID-19 and draw a successful conclusion to this unprecedented battle is worth paying attention to.

1. Dysfunction associated with COVID-19

Clinical observations and pathological studies have shown that COVID-19 is characterized by lung damage, but also involvement in heart, liver, kidney, digestion, motor function and mobility, brain and nerves and other organs and systems^[3]. Even when patients were clinical 'cured' and discharged, there are still some dysfunction.

1.1 Respiratory function

The lung damage of COVID-19 lead to the impairment of alveolar air exchange, and the decrease of pulmonary ventilation function. As a result, many patients reported dyspnea and chest tightness. Pulmonary fibrosis is another important factor that affects lung function in the long run.

1.2 Cardiac function

The levels of serum cardiac troponin I (cTnI), creatine kinase (CK), creatine kinase isoenzyme (CKMB), lactate dehydrogenase (LDH) and α -hydroxybutyrate dehydrogenase (α -HBDH) were significantly increased in some severe and critical patients. Elevated serum markers were often accompanied by tachycardia which was not proportional to the rise of body temperature. Whether these myocardial damages will result in long-term dysfunction deserves attention.

1.3 Functions of other organs

Studies suggested that the liver, kidney, brain, nervous, and immune systems of many critical patients have virus aggregation and tissue damage, as well as corresponding dysfunction. The outcome of these organ dysfunction remains to be researched.

1.4 Motor function

Weakness and decreased exercise capacity are the most common symptoms and

dysfunction. The causes of weakness can be attributed to the decline of exercise endurance associated with cardiopulmonary dysfunction, and to the muscle atrophy caused by long-term immobilization in severe patients, and may even be related to muscle invasion by the virus.

1.5 Self-care in daily living activities

Since majority of COVID-19 patients is middle aged and elderly people, many patients have comorbidities such as heart, brain, liver, and kidney, which exacerbates the dysfunction of discharged patients.

1.6 Psychological disorders

Most patients have various degrees of anxiety and depression at acute and recovery stage.

2. Effects of rehabilitation in each stage of COVID-19

2.1 Preventive effect

Primary prevention: COVID-19 is a self-limiting viral disease, and the immune capacity of human body is the first line of defense. It is possible to prevent disease or reduce the virus damage if we may take regular exercise before attach of virus, which is critical to maintain strong immune capacity, and reduce the prevalence of various chronic diseases. Secondary prevention: After the attack of the disease, appropriate rehabilitation may benefit to avoid complications and prevent or reduce dysfunction caused by the disease. Tertiary prevention: During the period of recovery and sequelae of the disease, prevent further dysfunction and/or recurrence of the disease, improve self-care in daily living activities, and promote the community integration.

2.2 Rehabilitation in acute stage

Since the confusions in pathology and natural process of the COVID-19, current clinical treatment and rehabilitation is lacking of scientific evidence yet. The current consensus for mild patients is that patients can perform respiratory training and mild aerobic training and Chinese traditional exercises (Tai-ji, Ba-duan-jin), as well as square dance, etc. have been carried out in mobile cabin hospitals. It demonstrated positive effect in maintaining exercise capacity and mental function. Therefore, many mild patients may

resume full vitality when discharged^[4-5]. However, there are still many obstacles and confusions for the rehabilitation measures in the acute stage of severe and critical patients. Because the main pathological damage of the COVID-19 patients is the accumulation of alveolar sticky sputum, the disorder of air exchange, and the threat of "inflammatory storm", there are still doubts about the suitability of usual respiratory muscle training, cough expectoration training and aerobic exercise. At present, the consensus is to adopt breath training at prone and/or semi recumbent bed position, moderate head elevation, limb mobilization, bed and bedside sitting and standing, as well as bedside walking^[4-5]. Respiratory training can be performed, but the most appropriate timing and program for rehabilitation interventions remain to be studied further. Some patients with chronic diseases such as cardio-cerebrovascular diseases and diabetes need corresponding rehabilitation treatment. Some patients with complications such as pressure ulcers, bladder dysfunction, and deep vein thrombosis also require corresponding rehabilitation. In addition, the psychological rehabilitation of patients is also of great significance. Recently, 4 cases of lung transplantation were performed in Jiangsu Province and Zhejiang Province, respectively. The post-operative rehabilitation treatment received great attention. For example, every lung transplant patient in Jiangsu Province is equipped with a full-time rehabilitation therapist, who is fully involved in posture, breathing training, activity training, swallowing training, nutrition support and psychological support, and is getting positive results.

2.3 Rehabilitation in recovery period

It is generally reported that there are need for medical rehabilitation in patients after hospitalization. Recently, Hubei Provincial Hospital of Integrated Chinese and Western Medicine conducted a survey (data to be published) and found that mild patients who were going to discharge still have sleep dysfunction (63.6%), poor exercise endurance (61.4%), mild dyspnea (57.9%), anxiety (62.1%), fear (50.0%) and poor motivation (41.8%). Majority patients (84.3%) have intention for rehabilitation, focusing on exercise guidance, diet guidance, physiotherapy, living guidance and appropriate Chinese Medicine techniques. In addition, the recovery of self-care in daily living activities, work and study ability, and the management of complications and

comorbidities are also important contents. For this purpose, remote rehabilitation approach has been on the stage to promote home and community rehabilitation after discharge [5-6]. However, for some severe cases, rehabilitation is more complicated which may lead to institutional rehabilitation. Fifteen designated rehabilitation hospitals have established in the Wuhan city. We must recognize that the medical outcome of patients is not ended only by a "cure" marked by negative virology tests and the control of pulmonary inflammation. Functional recovery and return to society are the ultimate medical outcomes.

3. Enlightenment of rehabilitation for COVID-19

In the battle against COVID-19, the medical emergency system in China has withstood unprecedented tests. At the same time, we also got much enlightenment for rehabilitation.

3.1 Position of rehabilitation in national emergency

Since 2008, medical rescue teams for major natural disasters have included rehabilitation experts. But in COVID-19, rehabilitation experts were not included. Understandably, in the acute stage, there is great pressure to save lives, so the main strength of rescue teams includes professionals in respiratory medicine, critical care medicine, nursing, and infection control. But in recent years, rehabilitation medical professionals in China have generally entered the early rehabilitation in ICU and majority of clinical disciplines. The National Health Commission of China has repeatedly proposed documents emphasizing early intervention of rehabilitation, including shortening the length of hospital stay, preventing and managing complications, reducing dysfunction and improving function, and clinical efficacy. Therefore, the clinical treatment of acute infectious diseases should be the same as the acute stage of diseases in other clinical disciplines. Rehabilitation ought to be beneficial as a team member. It is expected that the national medical emergency system will give rehabilitation an appropriate position at whole phase of emergency in the future, without being offside or absent.

3.2 Formulation of rehabilitation program

Rehabilitation emphasizes treatment with appropriate methods at the right time, including bed positioning, respiratory training, exercises and mobilization, physical modalities, occupational therapy, speech and swallowing therapy and traditional Chinese rehabilitation technology. However, it must be based on the premise of patients stability. Like clinical disciplines, rehabilitation should be guided with a rigorous attitude and evidence based. In the face of COVID-19, a completely unfamiliar disease, many new therapies and new methods of ‘rehabilitation’ have indeed ‘sprung up’. There are dozens of respiratory exercises, training programs, and even expert consensus and guidelines, but exploratory studies are not equal to scientific conclusion. Any scientific research requires rigorous design, research, data collection and analysis, and then to draw conclusions.

3.3 Focus of rehabilitation

COVID-19 has greatly promoted the widespread application of remote rehabilitation medicine. Due to the need of quarantine, many patients need to perform necessary rehabilitation training at home. As a result, various remote rehabilitation approaches are greatly accelerated, which includes wearable devices, mobile phone APPs, virtual reality. It is hoped that work in this direction will lead to a new era of smart rehabilitation.

3.4 Breakthroughs in smart rehabilitation equipment

Various robots (activities and exercises, assisted living, psychology, communication, logistics robots, etc.), wearable equipment, large data transmission (5G technology) and artificial intelligence (AI) analysis are of great value for disease prevention and control, medical care and rehabilitation. At present, logistics robot food delivery, telemedicine and wearable equipment vital sign monitoring have all played a role in the medical and rehabilitation of COVID-19, with broad prospects.

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