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Study on the Auxiliary Effect of KN95 Mask on the Physical Examination Activities under the background of New Coronavirus Epidemic Prevention

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Abstract: With the spread of novel coronavirus pneumonia, human survival is facing severe challenges. The new coronavirus is the main cause of pneumonia. The novel coronavirus is a new strain of coronavirus that has never been found in human body before. The individuals of the new coronavirus are very small, much smaller than the bacteria, which need to be observed by electron microscope. The new coronavirus is simple in structure, only composed of protein shell and internal genetic material (RNA), without cell structure. It can't grow and replicate independently. It can only parasitize in the living cells of human respiratory tract and lung. It can replicate itself by using the cell system of the host based on the genetic information of its own RNA. The newly generated virus will continue to infect other cells. Mask is an important novel coronavirus to prevent respiratory infectious diseases, and can reduce the risk of new coronavirus infection. The mask can not only prevent patients from spraying droplets, reduce the amount and speed of droplets, but also block the droplets containing coronavirus, so as to prevent the wearer from inhaling and protecting the susceptible population.

Keywords: *KN95 Mask, New Coronavirus, Epidemic Prevention, Health, Physical Examination Activities*

I. INTRODUCTION

China's novel coronavirus novel coronavirus infection guidelines and novel coronavirus infection guidelines for preventing infections were published in the official website of the national health and Health Committee in January 30, 2020. It is clearly indicated in this guide that masks are important defense lines for preventing respiratory infectious diseases and reduce the risk of new coronavirus infection. The mask can not only prevent patients from spraying droplets, reduce the amount and speed of droplets, but also block the droplets containing coronavirus, so as to prevent the wearer from inhaling and protecting the susceptible population. Respirator has become a very important respiratory protective equipment. But since December 2020, novel coronavirus infections have been increasing in Wuhan and surrounding areas of Wuhan. The important protective equipment of respirators has been difficult to purchase. To some extent, the masks donated by social love solve the urgent problem. However, there are many brands of masks donated by social love. Although some masks are well packed, they are not accompanied by Chinese or English instruction manuals, or they are accompanied by French, Spanish and other small languages, which is The use of masks by medical staff has brought difficulties, and a large number of non-medical protective masks (N95 / kn95) have been donated to the hospital. What are the similarities and differences between these non-medical protective masks and medical masks? Whether they can be used as medical protective masks or not requires full-time hospital staff to make a full assessment to protect the safety of front-line medical personnel.

The suitability test is the basic requirement to select the type of respirator suitable for the user and to ensure that the protective performance of the respirator can be maximized. According to the CDC survey data in the United States, the pass rate of quantitative suitability test of N95 particulate protective mask is 20% - 100%. In different user groups, there is a certain difference in passing rate. One of the reasons for the difference is the size of the user's head and face. As a new standard to measure the matching degree between masks and users, quantitative suitability test can quantify the leakage of masks, which has been recommended and adopted by more and more research institutions and enterprises.

Novel coronavirus pneumonia mainly includes fever, cough, fatigue, dyspnea, etc. a few cases can be seen with nasal congestion, runny nose, diarrhea and so on. Most of the patients become worse one week after onset, and may cause acute respiratory distress syndrome (ARDS), septic shock, metabolic acidosis, coagulation dysfunction, renal failure and even death. Positive nucleic acid test can be confirmed as infected. However, nucleic acid detection has a certain lag, which can not identify the hidden patients quickly and accurately. At present, some patients with negative nucleic acid test have been found in clinic, which lead to the further spread of the epidemic because they are not isolated in time. Novel coronavirus pneumonia is the main basis for the diagnosis of CT. The CT images of novel coronavirus pneumonia in early, advanced, severe and remission stages were different: mainly from ground glass to multiple lobes, and even white lung like lesions in the critical stage, followed by fibrosis foci. Chest CT examination is simple and easy, which can judge the severity and development of the disease quickly and intuitively. However, there are some limitations, such as no obvious image changes in the early stage, overlap with other pulmonary infections to some extent, etc.

II. THE PROPOSED METHODOLOGY

Study on New Coronavirus. Compared with ordinary viruses, new coronaviruses are very "cunning" because they have a special protein. This protein can make the immune system misjudge, so that part of the human cells as an enemy and attack. As a result, some people who were infected with heart disease, diabetes and other diseases died because of the wrong attack of the autoimmune system on the lesion. There are also some infected people because of the immune system overreaction, causing more immune cells to come to fight, resulting in the immune cells over excited, under the wrong judgment crazy attack lung cells, so that lung fibrosis, lung can not expand breathing, the infected people eventually suffocated. But under the treatment of medical staff, the gradually stronger immune cells in patients will lock the "crown" of the virus,

make the virus lose the ability to infect, and stick many viruses together to eliminate.

The novel coronavirus pneumonia is highly visible in human transmission, and there is a certain range of community communication. Therefore, the epidemic prevention and control is determined as the level I response to major public health emergencies, and all communities (villages) implement closed management. With the joint efforts of the whole nation, the epidemic situation in our country has been effectively controlled, but we still can't take it lightly. Please keep in mind that wearing masks, washing hands frequently, ventilating more, not gathering, not panicking, not believing in rumors, not spreading rumors, and doing epidemic protection at all times is the basic guarantee for the victory of this epidemic prevention war.

The new coronavirus binds to the membrane protein of angiotensin converting enzyme 2 (ACE2) on the surface of pulmonary epithelial cells through the spike protein (s protein) on the surface of virus particles, and then the shape and structure of ACE2 changes, leading to the virus entering the cells. New virus particles are synthesized by chemical reactions using amino acid molecules, nucleotide molecules and lipid molecules of cells themselves. These new virus particles are released to the outside of cells, and in the same way, they infect surrounding normal cells, resulting in a large number of cells infected by viruses. After the host's immune system detects foreign pathogens, the natural immune system is activated and a large number of immune cells enter the lung tissue. At the same time, cytokines are released to form cytokine storm and attack the infected cells. It eventually leads to pneumonia and even acute respiratory distress syndrome.

Since the outbreak of novel coronavirus pneumonia, a comprehensive survey has found that there are about 20 universities, research institutes and enterprises in China. Through single cell PCR technology, antibody library technology, receptor -Fc fusion protein technology, human antibody transgenic mouse technology, hybridoma technology and so on, 5 new routes of neutralization antibody and cytokine storm antibody have been developed. In terms of using single cell PCR technology, eight teams, including Zhang Linqi of Tsinghua University, Yan Jinghua of Institute of Microbiology of Chinese Academy of Sciences and Xie Xiaoliang of Peking University, carried out relevant research. Among them, team Zhang Linqi from Tsinghua University and Shenzhen Third People's hospital successfully isolated more than 200 highly effective monoclonal antibodies against the new coronavirus from 8 convalescent patients' B lymphocytes. The results showed that the serum of 8 patients had no binding ability to the receptor binding region (RBD) of SARS virus and mers virus, and could not neutralize the two viruses, only had strong binding ability to RBD of new coronavirus, only neutralized the new coronavirus. At the same time, it is found that the antibody has great variability among different individuals, but on average, about 58% of antibody clones have reactivity. These antibodies come from a wide range of antibody heavy chain and light chain families.

Antiviral Therapy. At present, three therapeutic drugs, chloroquine phosphate, ridcivir and fabiravir, have been preliminarily selected, which can effectively inhibit the replication of the virus in vitro, but their safety and effectiveness in human body need clinical verification. The vaccine for novel coronavirus has just started, but the speed of human development of vaccine has been greatly improved compared to that of SARS. It is reported that many vaccines have made good progress, and the first batch of experimental mice have produced antibodies.

The anti-inflammatory effect of physical factors has been confirmed by clinical practice. Some scholars tried to use ultrashort wave to treat SARS, and achieved good results. Ultrashort wave has strong penetration, can enhance phagocyte function, inhibit leukocyte activation, improve pulmonary blood circulation, accelerate the absorption of inflammatory exudate, and has good anti-inflammatory effect. However, novel coronavirus pneumonia is still not safe and effective by ultrashort wave. The existing expert consensus points out that for light and ordinary patients, under the safety monitoring, micro heat ultrashort wave can be used appropriately, while for heavy and critical patients, it is not recommended temporarily.

Novel coronavirus pneumonia is not clear about the impact of new crown pneumonia on body structure and function because of the critical condition. The contraindications of respiratory rehabilitation should be eliminated, and the basic principle is not to increase the burden of clinical infection protection. The specific consultation requirements of the clinician should be obtained, and the detailed infection prevention and control measures and respiratory rehabilitation treatment plan should be worked out jointly with the clinical medical team before carrying out.

In the aspect of using human antibody transgenic mouse technology, the research team of Chongqing Academy of animal husbandry and Chongqing Jinmai Bo Co., Ltd. cooperated to immunize human antibody mouse camouse with S protein antigen on the surface of new coronavirus. Twenty hybridomas which can block the binding of S protein on the surface of the virus to ACE2 receptor were screened and selected by using human antibody mice with good immune response, and the antibodies secreted by these hybridomas have high affinity. At present, the antibody genes of these 20 hybridoma cells are sequenced and recombined to prepare high-purity antibody samples for live virus neutralization test and virus infection animal model test.

Researchers from regeneron and Utrecht University in the Netherlands and other teams obtained human antibodies from transgenic animals (transgenic mice, etc.). Among them, the University of Utrecht in the Netherlands adopts the H2L2 all human mouse platform. After immunizing the mice, it can produce monoclonal antibodies with two full human heavy and light chains, which are no different from human antibodies, thus reducing the process of humanization, and screening out the S1b domain (s protein binding ACE) that can simultaneously bind the S protein of SARS virus and new coronavirus The receptor part is located in the structural segment).

With the development of biotechnology, under the guidance and support of the state, new drug research and development in China is changing from "China new" to "global new". The gap between China and some developed countries in medicine level is becoming smaller and smaller. Biomedicine has occupied the core position in the pharmaceutical field. The biopharmaceutical industry chain, which is represented by monoclonal antibody drugs, including nucleic acid vaccine, blood products, recombinant protein drugs, polypeptide drugs and gene therapy, is forming. The market space of antibody drugs in China is huge.

The Auxiliary Effect of KN95 Mask on Physical Examination. The National Institute for occupationa l safety and health (NIOSH) certified respirators include N95, n99, N100 and many other models. Among them, N95 respirators are

the most common, and the filtering efficiency of the filter material of the respirator for dust, acid mist, paint mist, virus aerosol and other non oil particles with diameter ≥ 0.3 μ m is ≥ 95%. Although the United States has recommended the use of N95 masks by local medical staff for the prevention of air borne respiratory diseases such as tuberculosis and influenza for some time, it has not been universally recognized. It is mainly worn by industrial personnel, because its function of preventing liquid splashing and penetration has not been tested

Kn95 respirator is a kind of protective respirator conforming to the Chinese gb2626-2006 standard. It is mainly suitable for the self-priming filter respirator used to protect all kinds of particles in industrial production. The filtering efficiency of the filter material to the salt particles with a diameter of (0.075 ± 0.020) μ m is ≥ 95%. Unlike N95 in the United States, this kind of respirator does not refine the particle types. The same as N95, this kind of respirator has not been tested for liquid splashing and penetration. 1.2.5 kf9 respirator KF series standards of South Korea are the mainstream respirator standards issued by the food and Drug Administration (MFDs) of South Korea. KF series is divided into kf80, kf94 and kf99. Kf94 is the most common in the domestic market. Kf94 standard is that the effective filtration rate for oily and salty particles ≥ 94%, while other standard masks above do not contain oily particles

In the current situation of the shortage of medical protective masks, the protective masks that meet kn95 or N95 standards can be temporarily used instead of medical protective masks. Specifically, novel coronavirus pneumonia patients in the ward of suspected mild acute respiratory syndrome can be used for medical treatment. However, because of the fact that industrial protective masks can not be guaranteed to prevent liquid spatter and infiltration function, they are engaged in liquid splatting operations (such as tracheotomy, intubation, open sputum aspiration, bronchoscopy, alveolar lavage, catheterization). In addition to adding goggles or protective screen as physical barrier, a layer of medical surgical mask should be added to kn95 or N95 mask, because although the filtering rate of medical surgical mask for particulate matter is only 30%, its splashing and impermeability functions can be met. Therefore, this wearing method can not only protect the inner mask from penetration, but also ensure the effective filtration rate. In clinical practice, once it is found that the outer surgical mask is polluted by visible liquid, the outer mask should be replaced immediately, and the inner mask should also be replaced when conditions permit, so as to maximize the safety of medical workers.

After carefully reading the mask instructions and passing the above experimental verification, from January 28, 2020 to February 28, 2020, about 300 people used this method for personal protection. At present, in addition to the increase of respiratory resistance in 6 wearers, no adverse information feedback such as respiratory tract exposure and infection has been received, so the practice proves that this measure is effective. In addition, kf94 has also passed the flushing test and funnel test, and the test results are consistent with other masks, but its particle filtration efficiency is different from that of medical protective masks, kn95 and kn95, so it is not recommended to be used in medical environment.

The size of human head and face is one of the important basis for the design of particle respirators, and the suitability of cup respirators for different face types is quite different. One of the reasons is that the shape of the cup-shaped mask is fixed, and the change of the face size of different heads will have a certain impact on its fit with the face. Because of the great difference in the suitability of N95 particle respirator, the suitability test before use is the necessary measure to ensure the protection effect.

CONCLUSION

During the epidemic period novel coronavirus pneumonia is very important in clinical screening, diagnosis, treatment and rehabilitation, and rehabilitation will go through the whole process of disease treatment and rehabilitation. The rehabilitation goal of novel coronavirus pneumonia is to improve respiratory function, enhance physical and immune function, improve the quality of life, improve prognosis, and eventually return patients to families and integrate into society. With the development of the epidemic situation and the increase of discharged patients, rehabilitation treatment will further play an important role.

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