LABORATORY DIAGNOSIS OF CORONAVIRUS INFECTION

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Annotation. At the end of 2019, a new subtype of coronavirus, called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), spread rapidly around the world, causing a global pandemic. Initially, the proportion of confirmed cases among children was relatively small, and it was believed that they rarely become infected. Subsequent observations showed that in children and adolescents, the infection is either asymptomatic or accompanied by minimal clinical symptoms, and therefore the true incidence is underestimated due to the low level of testing.In most children, infection is either asymptomatic or accompanied by an erased clinical picture. Vaccination of children and adolescents is recommended mainly to achieve collective immunity in all age groups. However, there is no convincing data on the duration of the immune response, the level of the required protective titer of antibodies, as well as on the long-term side effects of vaccination due to insufficient follow-up and uncertainty of the criteria for an immune response.

Keywords: coronavirus, COVID-19, SARS-CoV-2, people, pneumonia, respiratory failure, laboratory diagnostics

ЛАБОРАТОРНАЯ ДИАГНОСТИКА КОРОНАВИРУСНОЙ ИНФЕКЦИИ

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Аннотация. В конце 2019 г. новый подтип коронавируса, названный коронавирусом тяжелого острого респираторного синдрома 2 (SARS-CoV-2),

быстро распространился по миру, вызвав глобальную пандемию. Изначально доля подтвержденных случаев среди детей была относительно небольшой, и считалось, что они заражаются редко. Последующие наблюдения показали, что у детей и подростков инфекция протекает либо бессимптомно, либо сопровождается минимальной клинической симптоматикой, в связи с чем истинная заболеваемость недооценивается из-за низкого уровня тестирования.У большинства детей заражение протекает либо бессимптомно, либо сопровождается стертой клинической картиной. Вакцинация детей и подростков рекомендуется в основном для достижения коллективного иммунитета во всех возрастных группах. Однако отсутствуют убедительные данные о длительности иммунного ответа, уровне необходимого защитного титра антител, а также об отдаленных побочных эффектах вакцинации в связи с недостаточным сроком наблюдения и неопределенностью критериев иммунного ответа.

Ключевые слова: коронавирус, COVID-19, SARS-CoV-2, люди, пневмония, дыхательная недостаточность, лабораторная диагностика

Coronavirus is an acute viral disease characterized by predominant damage to the respiratory system and gastrointestinal tract. Coronavirus is a zoonotic infection by origin. Coronavirus in humans of the first or second group is considered to be the causative agent of non-severe respiratory viral infections. The most severe clinical manifestations can be observed when infected with the following pathogens: the SARS-Cov virus causes the development of atypical pneumonia or severe acute respiratory syndrome; The MERS-CoV virus causes Middle Eastern respiratory syndrome, which is characterized by the development of acute pneumonia and renal failure. The 2019-nCoV virus causes the development of respiratory distress syndrome.

Coronavirus infection is caused by RNA genomic viruses of the genus Coronavirus. The coronavirus is surrounded by a supercapsid, which is riddled with sparsely spaced spikes having the structure of thin necks and spherical heads located on them, which resembles a crown in appearance.Respiratory and intestinal coronaviruses are pathogenic to humans. The most common type of respiratory disease is usually diagnosed as acute.Viruses are unstable in the external environment. They instantly die at temperatures above degrees, are destroyed by the action of chloroform, formalin, ethyl alcohol or ether. Coronavirus tolerates freezing well. As information about the viral load of children and adolescents and their role in virus transmission accumulates, diagnostic approaches in this age group have been optimized. The effectiveness of the treatment has been tested on patients admitted to the hospital and treatment recommendations have been developed. Currently, global research efforts are focused on the protection of particularly vulnerable children, the prospects for total vaccination of children, its effectiveness and safety. The virus is spread by airborne

droplets through inhalation of droplets sprayed in the air when coughing, sneezing or talking with the virus, as well as through contact with the virus on the surface, followed by introduction into the eyes, nose or mouth. Masks are the main means of preventing the spread of infection, but they should be used together with a set of other preventive measures, including maintaining a safe distance and avoiding staying in confined spaces with a large number of people. Effective preventive measures include frequent hand washing and compliance with the rules of respiratory hygiene. Vaccination is a safe and effective way to reduce the risks of death from the disease, severe course, symptomatic cases and the occurrence of the infection itself. Vaccines are the most important new means of fighting the disease, but getting vaccinated does not mean that standard preventive measures can be neglected, since vaccination is primarily aimed at protecting against the disease, not infection. After vaccination, short-term mild side effects can usually occur, including headaches, muscle pain, chills and fever.

Laboratory diagnostics

Laboratory diagnostics is carried out in accordance with the temporary recommendations of Rospotrebnadzor dated January 21, 2020 for the laboratory diagnosis of a new coronavirus infection caused by 2019-nCoV. [3, 7, 17].

The PCR method is used for laboratory diagnosis of infection caused by 2019-nCoV. The detection of 2019-nCoV RNA by PCR is performed in patients with clinical symptoms of a respiratory disease suspected of infection caused by 2019-nCoV, especially those arriving from epidemiologically disadvantaged regions immediately after the initial examination, as well as contact persons.

The biological material for the study is: material obtained by taking a smear from the nose, nasopharynx or oropharynx, bronchial flushing waters obtained by fibrobronchoscopy (bronchoalveolar lavage), (endo) tracheal, nasopharyngeal aspirate, sputum, biopsy or autopsy lung material, whole blood, serum, urine. [3,10, 16] The main type of biomaterial for laboratory examination is a smear from the nasopharynx and/or oropharynx. Similar results were obtained by other researchers, which led to the conclusion that altered coagulation parameters and increased thrombosis are predictors of poor prognosis in patients infected with SARS-CoV-2. It is also noted that hypertension and CVD in the anamnesis were significantly more common among patients with severe infection. In a recent study of an infected patient from Samarkand, the average age of patients was 63 years, men were 82%, the proportion of patients with hypertension, diabetes and previous CVD was 49%, 17% and 21%, respectively. The analysis in the intensive care unit showed that the deceased were older and had a higher incidence of hypertension compared to the survivors (63% vs. 40%, $p < 0.001$). All samples obtained for laboratory testing should be considered potentially infectious and the requirements "Safety of working with microorganisms of pathogenicity groups I and II (danger)" should be observed when working with them. Medical workers who

collect or transport clinical samples to the laboratory must be trained in the practice of safe handling of biomaterials, strictly observe precautions and use personal protective equipment. The collection of clinical material and its packaging is carried out by an employee of a medical organization trained in the requirements and rules of biological safety when working and collecting material suspected of infection with microorganisms of group II pathogenicity, in accordance with the temporary recommendations for laboratory diagnostics. [3,2, 8]

Samples from patients with coronavirus infection or contact persons are selected for laboratory diagnostics in accordance with the interim recommendations for laboratory diagnosis of a new coronavirus infection caused by the 2019-nCoV virus, sent to the executive authorities of the subjects. The samples must be transported in compliance with the requirements of the "Procedure for accounting, storage, transfer and transportation of microorganisms of pathogenicity groups I - IV". [9,12, 15]

The name of the suspected ORI must be indicated on the accompanying form, having previously notified the laboratory of which sample is being transported. Transportation is possible on ice.

The transportation of samples must be carried out in accordance with the requirements of sanitary legislation in relation to microorganisms of the II pathogenicity group. [1,11, 2]

To carry out differential diagnosis in all patients, PCR studies are carried out on pathogens of respiratory infections: influenza viruses type A and B, respiratory syncytial virus (RSV), parainfluenza viruses, rhinoviruses, adenoviruses, human metapneumoviruses, MERS-CoV. Microbiological diagnostics (culture examination) and/or PCR diagnostics for Streptococcus pneumoniae, Haemophilus influenzaetype B, Legionella pneumophila, as well as other pathogens of bacterial respiratory infections of the lower respiratory tract are mandatory. Rapid tests for the detection of pneumococcal and legionella antigenuria can be used for express diagnostics. The course of pneumonia in young patients had a benign character with earlier admission to the hospital. The absence of regression of viral pneumonia in a third of young patients with COVID-19 with moderate severity at discharge dictates the need for dispensary monitoring of all patients with a new coronavirus infection to identify and assess the consequences of the disease, if necessary, timely treatment and rehabilitation of complications. Further study of the mechanisms of COVID-19 immunopathogenesis will improve the prognosis of the course and prevent complications of a new coronavirus infection caused by SARS-CoV-2.

When sending biological samples from patients with suspected infection caused by coronavirus 2019-nCoV for laboratory tests, as well as upon receiving a positive result at any stage of diagnosis, information is immediately sent to the covid center. [3,7, 6]

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