

## FEATURES OF GLUCOCORTICOIDES USING FOR TREATMENT OF A PATIENT WITH A NEW CORONAVIRAL INFECTION IN THE CONDITIONS OF THE OBSERVATOR ON THE BASIS OF STUDENTS' DORMITORY

### Clinical case

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The article is devoted to the peculiarities of providing medical care for coronavirus infection in a university student who has been moved to an observatory organized in a hotel-type hostel of the university to prevent the spread of COVID-19 among students living in hostels. The article provides data on the positive experience of using dexamethasone in the treatment regimen for moderately severe disease, follow-up and examination data. The article considers the tactics of managing a patient with suspected COVID-19 in the presence of data for pneumonia according to computed tomography and clinical manifestations characteristic of a new coronavirus infection, which was later confirmed in the study of antibodies to SARS-CoV-2. The importance of round-the-clock medical monitoring of persons placed in the observatory, finding out the details of the epidemiological history from them, as well as determining the tactics of their treatment with limited hospitalization opportunities in a growing number of patients with severe manifestations of COVID-19 requiring inpatient treatment is emphasized.

A new coronavirus infection can lead to a rapid deterioration of the condition in young patients, which is not always manifested by severe lung damage according to computed tomography data, but is characterized by persistent fever that cannot be stopped by antipyretics, as well as severe muscle pain, severe asthenia, which can be considered as clinical indicators of the development of hyperactive inflammatory syndrome. The use in the treatment regimen of intravenous dexamethasone at a dose of 0.1 mg/kg of body weight twice led to a rapid normalization of temperature, relief of all clinical symptoms and was not accompanied by any complications both in the early period of convalescence and 2 months after discharge from the observatory.

**Keywords:** COVID-19; management and medical care; indications for admission to hospital; observatory at hostel; dexamethasone.

## ОПЫТ ИСПОЛЬЗОВАНИЯ ГЛЮКОКОРТИКОИДОВ ПРИ ЛЕЧЕНИИ ПАЦИЕНТА С НОВОЙ КОРОНАВИРУСНОЙ ИНФЕКЦИЕЙ В УСЛОВИЯХ ОБСЕРВАТОРА НА БАЗЕ СТУДЕНЧЕСКОГО ОБЩЕЖИТИЯ

### Клинический случай

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Статья посвящена особенностям оказания медицинской помощи при коронавирусной инфекции студенту вуза, перемещенному в обсерватор, организованный в общежитии гостиничного типа университета для предотвращения распространения инфекции COVID-19 среди обучающихся, проживающих в общежитиях. Описан позитивный опыт использования в схеме лечения дексаметазона при среднетяжелом течении заболевания, приведены данные динамического наблюдения и обследования. Рассмотрена тактика ведения пациента с подозрением на COVID-19 при наличии пневмонии по результатам компьютерной томографии и клинических проявлений, характерных для новой коронавирусной инфекции, которая в дальнейшем была подтверждена при исследовании антител к SARS-CoV-2. Подчеркнута важность

круглосуточного медицинского наблюдения за пациентами, размещенными в обсерваторе, выяснения у них деталей эпидемиологического анамнеза, а также определения тактики их лечения при ограниченных возможностях госпитализации в стационар в условиях нарастающего количества пациентов с тяжелыми проявлениями COVID-19, нуждающихся в стационарном лечении.

Новая коронавирусная инфекция может привести к быстрому ухудшению состояния молодых пациентов, которое не во всех случаях проявляется тяжелым поражением легких по данным компьютерной томографии, а характеризуется стойкой лихорадкой, не поддающейся купированию жаропонижающими средствами, а также сильной мышечной болью, выраженной астенией, которые можно расценить как клинические индикаторы развития гиперактивного воспалительного синдрома. Внутривенное введение дексаметазона в дозе 0,1 мг/кг массы тела двукратно привело к быстрой нормализации температуры тела, купированию всех клинических симптомов и не сопровождалось какими-либо осложнениями как в ранний период реконвалесценции, так и спустя 2 мес. после выписки из обсерватора.

**Ключевые слова:** COVID-19; медицинская помощь; показания для госпитализации; обсерватор; общежитие для студентов; дексаметазон.

### Introduction

Many aspects of the coronavirus infection pathogenesis are still unknown. To date, it has been established that damage to the microvasculature plays an important role in the pathogenesis of the novel 2019 coronavirus disease (COVID-19). A pronounced alveolar-hemorrhagic syndrome is typical for most cases, up to the formation of actual hemorrhagic infarctions (although true hemorrhagic infarctions are not uncommon). Some cases revealed abnormalities in other organs (in addition to vasculitis), which can presumably be associated with generalized coronavirus infection, which manifests itself as lesions of the intestine (catarrhal and hemorrhagic gastroenterocolitis), brain and pia mater (encephalitis and meningitis), heart (myocarditis), pancreas, kidneys, and spleen [1].

At the time of this writing, 1,151,438 people with confirmed COVID-19 have already been registered in the Russian Federation, which also registered 20,324 deaths. In St. Petersburg, 42,257 people had laboratory-confirmed COVID-19, including 2894 lethal outcomes. As regards the number of deaths from COVID-19, St. Petersburg ranks first in the Russian Federation. Worldwide, 32,840,012 people were reported to have COVID-19, and 994,143 people died. Brazil ranks first in terms of the number of infected, and Russia ranks fourth [2].

The most common clinical symptoms of COVID-19 are now well known. They include an increase in body temperature (>90%), dry cough (80%), dyspnea (55%), fatigue (44%), a feeling of congestion in the chest (>20%), a decrease in sense of smell and taste (33.9%–68.0%), myalgia (11%), confused mental state (9%), headache (8%), hemoptysis (5%), diarrhea (3%), nausea, vomiting, and palpitations. In case of lung damage, which manifests itself on day 6–7 of the disease, the respiratory rate increases, and dyspnea occurs with exercise [1].

COVID-19 is classified by severity based on the intensity of clinical symptoms and pulse oximetry data; computed tomography (CT) findings of the chest, which is crucial in determining the volume of lung lesions and their severity; levels of C-reactive protein in the blood serum; as well as the level of ferritin, which is a predictor of increased thrombus formation and recently regarded as one of the principal links in the pathogenesis of COVID-19. Management approach is determined based on the severity of the patient's condition.

The document developed by the Interdepartmental Medical Working Group under the Interdepartmental City Coordination Council for Counteracting the Spread of a New Coronavirus Infection (COVID-19) in St. Petersburg, titled "Methodological recommendations, algorithms for the actions of medical workers at various stages of care, checklists, and standard documents developed for the period of the presence and threat of further spread of a new coronavirus infection in St. Petersburg" (revision 2, dated June 10, 2020) [3], presents the indications for hospitalization of persons in contact with patients with COVID-19 (or laboratory-confirmed COVID-19) as well as patients with acute respiratory viral infection (ARVI) with no history of contact, but aged >65 years and with risk factors. The indications are as follows:

- The patient's condition is moderate and severe.
- Fever above 38°C, including corresponding history if the patient took antipyretic drugs.
- Respiratory rate more than 22 breaths per minute.
- Oxygen partial pressure lower than 95% according to pulse oximetry.
- Impossibility of isolation when living with people of risk groups.
- Pregnancy.
- Children aged 0–3 years.

An additional criterion is CT data corresponding to grade II and higher (more than 25% of lung tissues).

Patients aged <65 years without risk factors, who have not been in contact with patients with COVID-19, with clinical manifestations of ARVI but no signs of pneumonia, are treated on an outpatient basis.

However, the document states that the indications for hospitalization can be determined on an individual basis. In other words, hospitalization is indicated for patients with moderate or severe COVID-19.

In this regard, the treatment of patients with mild COVID-19 is handled by outpatient doctors. Several drugs can be used in the treatment of COVID-19. These include favipiravir, hydroxychloroquine, azithromycin (in combination with hydroxychloroquine), and interferon-alpha preparations, as well as remdesivir and umifenovir. However, the currently available information on the results of drug therapy is insufficient to make an unambiguous conclusion about the effectiveness or ineffectiveness of these drugs. Therefore, their prescription is permissible based on the decision of the medical commission if the potential benefit to the patient outweighs the risk of their use [1]. Dexamethasone is the only drug that has demonstrated a real effect on the survival rates for patients with COVID-19 to date. Glucocorticoids suppress inflammation in all phases and synthesis of a wide range of pro-inflammatory mediators. An increase in the concentration of these pro-inflammatory mediators during a cytokine storm is associated with a poor prognosis in COVID-19 and the risk of developing acute respiratory distress syndrome and sepsis.

The use of hormones in patients with critical illness is not new, and they can cause a number of side effects. In this regard, the authors of the RECOVERY study [4] recommended prescribing dexamethasone to patients with severe disease. However, in situations with limited hospitalization opportunities for patients with severe COVID-19, the use of hormones in a short course, in our opinion, can help stabilize the patient's condition and ensure rapid relief of symptoms.

### Description of the clinical case

A fourth-year student of the Department of General Medicine of I.I. Mechnikov North-Western State Medical University, who was born in 1998, was transferred to the observatory on May 30, 2020, due to an increase in body temperature to 38.2°C, asthenia, and nagging pain in the lumbar region during movement. The observatory was located in one of the blocks of a hotel-type hostel and was established to reduce the spread of

COVID-19 among students living in three dormitories of the I.I. Mechnikov North-Western State Medical University. Aspects of its arrangement, efficiency of work in terms of epidemiological control, and specifics of medical round-the-clock monitoring have been described [5].

Upon examination at admission, the patient complained of moderate asthenia, dry occasional cough, chest pain during breathing, and fever up to 38.2°C. After taking paracetamol, the temperature decreased to 37.4°C. On examination, the patient had a regular physique, with a height of 190 cm, body weight of 98 kg, normal skin color, heart rate of 72 beats per minute, blood pressure of 120/70 mm Hg, and respiratory rate of 17 breaths per minute. On lung auscultation, weakened vesicular breathing was heard, but no respiratory sounds were heard. On percussion over the entire surface of the lungs, a clear pulmonary sound was heard.  $S_pO_2$  was 97%. The abdomen was symmetrical, soft, and painless. There were no peritoneal symptoms. The liver and spleen were not palpable. The tongue was moist and clean. Defecation and urination were normal according to the patient. The kidney percussion test on the lower back was negative on both sides. The kidneys were not palpable. There were no pathological changes in the musculoskeletal system. There were no meningeal symptoms. The history was not remarkable.

Epidemiological anamnesis revealed that the student worked as a paramedical worker in the intensive care unit of the clinic of the I.I. Mechnikov North-Western State Medical University, which was repurposed to provide care to patients with COVID-19. The student worked the last day shift from May 28 to May 29, 2020. On the night from May 29 to May 30, 2020, after the shift, he felt a sudden deterioration of health in the form of severe asthenia and an increase in body temperature to 38.2°C. Thus, the incubation period could be from 1 to 10 days. The student lived alone in a dorm room, which enabled to maintain isolation conditions.

In the observatory, during the follow-up period from May 30, 2020, to June 01, 2020, his body temperature increased to 38.7°C, which was not responsive to paracetamol. He also had progressing asthenia, dry cough, and muscle pain, which was most pronounced in the lumbar region, but there were no abnormalities in respiratory movements, and oxygen saturation remained within the normal range. He was prescribed with the following: azithromycin 500 mg once a day as an antibacterial drug with anti-inflammatory effect, licorice root syrup one tablespoon in 200 ml of water orally 2 times a day, vitamin C at a dose of 500 mg 2 times a day, and vitamin D in a dose of 4000 IU once a day.

As previously reported, vitamin D was used in all students with laboratory-confirmed COVID-19 who moved to the observatory, as well as with its suspected development, since there was information about the empirical prescription of this drug for the prevention and treatment of COVID-19 [6]. At the time of this writing, the results of that study have been published in *Lancet*, which confirmed the reasons of using vitamin D for the prevention and treatment of COVID-19. Similar results were reported initially by a large-scale randomized placebo-controlled trial to evaluate the efficacy of this method to prevent and treat COVID-19 [7]. On June 01, 2020, a nasal and oropharyngeal swab was taken from the patient for laboratory testing for COVID-19 (Laboratory of Molecular Genetic Microbiology, P.N. Kashkin Research Institute of Mycology), but no virus RNA was detected.

According to the patient, on June 03, 2020, the pain in the lumbar region increased, there were nagging pains in the back and neck, and his body temperature was 38.1°C. Chest CT was then performed. CT revealed signs of viral pneumonia, with mild severity, and CT-1 (up to 15% on the right). The patient refused hospitalization since he only had mild lung damage as detected by CT and a negative smear test for SARS-CoV-2. Taking into account the severity of pain in the lumbar region, on June 4, 2020, the patient underwent urinalysis, which revealed leukocytes 10–20 in the field of view and protein of 1 g/l, which could indicate pyelonephritis. Phytonephrol was additionally prescribed. On the same day, taking into account the fever, which was not alleviated by paracetamol, and the increasing intoxication, the patient was administered dexamethasone intravenously at a dose of 0.1 mg/kg of body weight in a dilution of 200 ml of 0.9% sodium chloride solution. On the following day, after repeated administration of dexamethasone, the patient noted a significant improvement in well-being, muscle pain disappeared, including the lumbar pain, body temperature returned to normal, and

asthenia decreased. The heart rate, blood pressure, and respiratory rate were within the normal range, and the oxygen saturation was 98%. On June 10, 2020, a repeat urine study was performed and it did not show any abnormalities. On the same day, biochemical blood test revealed a minor increase in the activity of alanine aminotransferase (70 U/L), and aspartate aminotransferase (934 U/L), and levels of C-reactive protein (2.43 mg/L) and creatinine (76 µmol/L) were within the normal range. The clinical blood test showed no abnormalities. The patient was discharged from the observation facility on June 12, 2020, in a satisfactory condition. His diagnosis was suspected moderate COVID-19 complicated by mild community-acquired right-sided polysegmental pneumonia (CT-1), acute pyelonephritis (ICD-10 code U07.2). COVID-19 virus was not identified.

After 2 months, the patient performed independently a test for antibodies to SARS-CoV-2, which showed a significant increase in the IgG level to 6.47 (the test is considered positive when the antibody titer is above 1.4), which confirmed indirectly the COVID-19 infection in the history. When the patient was interviewed by phone on September 01, 2020, he had no complaints, felt generally well, and did not notice signs of asthenization.

### Conclusion

COVID-19 in young patients can progress with various clinical manifestations, including kidney lesion in the form of pyelonephritis. Persistent hyperthermia, severe myalgia, and asthenia are indicators of a complicated course of the disease. To eliminate them, dexamethasone at a dose of 0.1 mg/kg administered intravenously can be used, as it prevents the development of a cascade of inflammatory reactions. However, multicenter randomized clinical trials are warranted for the widespread introduction of hormone therapy into clinical practice in case of moderate COVID-19.

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