

## Several Cases of Successful Treatment of Children with Multisystem Inflammatory Syndrome against the Background of Covid Infection-19

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**Received:** December 02, 2022; **Published:** December 10, 2022

### Abstract

Three cases of successful treatment of children 2, 5 and 10 years old with multisystem inflammatory syndrome against the background of COVID-19 infection in the department of pediatric anesthesiology and resuscitation were analyzed.

**Keywords:** New Coronavirus Infection; Children; Multisystem Inflammatory Syndrome

### Introduction

The infection caused by the covid-19 virus has posed a serious problem for humanity in terms of treatment, organization of anti-epidemic measures and led to serious economic losses. At the time of writing (30.11.20 22), 546,695,532 people have fallen ill in the world, 5,632,913 people have died, and 529,400,078 people have recovered. The global total is 1.03%.

In Russia, a person fell ill, of which 121,873 died, the mortality rate was 1.82%. In different countries, the number of sick children from newborns to 18 years old ranges from 0.8 to 2.8% [1,2]. Children are often asymptomatic with coronavirus and occupy one of the key positions in the spread of this pathogen. Usually, coronavirus infection in children is mild, but there are also severe cases that occur against the background of obesity, diabetes and other diseases. The severe course of the disease in children with COVID-19, in clinical manifestations, is very similar to the well-known Kawasaki syndrome [1,3,4]. This dangerous disease damages coronary and other vessels, and also has vivid external symptoms. Cider manifests itself in the form of myocardial infarction, meningitis or other serious complications. This course of coronavirus infection is explained by the hyperreactive immune response of the body with the development of the so-called "cytokine storm". As a result of the development of polyclonal activation of immune system cells, neutrophils are destroyed with the release of proteolytic enzymes, which, in turn, causes the destruction of red blood cells and platelets with the development of bleeding, thrombosis, DIC syndrome and multiple organ failure. Activation of the compliment system by proteolytic enzymes leads to the development of pulmonary edema, characteristic of a severe form of coronavirus infection. The mortality rate in such patients is up to 70 - 90% [1-4]. Frequent false-

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**Citation:** SA Guskov, *et al.* "Several Cases of Successful Treatment of Children with Multisystem Inflammatory Syndrome against the Background of Covid Infection-19". *EC Clinical and Medical Case Reports* 6.1 (2023): 08-13.

negative RESULTS of PCR diagnostics for SARS-CoV-2 in some cases are the reason for the admission of patients with COVID-19 not to covid hospitals, but to ordinary hospitals that do not have special drugs for the treatment of a new coronavirus infection. The absence of this group of drugs, as well as the serious condition of patients, pose serious difficulties for their treatment. However, with the correctly chosen syndromic treatment tactics, you can count on a positive outcome of the disease [5].

Cases of successful treatment of children 2, 5 and 10 years old with multisystem inflammatory syndrome against the background of a covid-19 infection in the department of anesthesiology and resuscitation of the Bratsk Children's City Hospital are presented, which is not a covid hospital by order.

### Materials and Methods

In the Department of Anesthesiology and Resuscitation of the OGBUZ "Bratsk Children's City Hospital" in the period from 17.12.2020 - 30.04.2021. three children with a diagnosis of Multisystem Inflammatory Syndrome associated with a new coronavirus infection were successfully treated.

#### Case No. 1

Patient V., 10 years old 14.12.2020. she was taken to the Bratsk Children's City Hospital in the infectious diseases department. Exhibited DS: ARVI, right-sided pneumonia. Received cefotaxime, amikacin, ACC, grippferon.

From the anamnesis: according to her parents, the girl has been ill since 09.12.2020, when a cough, a runny nose appeared. From 12.12.2020. an increase in temperature to + 39.0C, which was poorly reduced under the influence of antipyretics, loose stools 1 time. They were treated independently - tizin, thyme, cycloferon, ibuklin, sumamed.

On 17.12.2020, the condition worsened, abdominal pain, vomiting, a single loose stool, tension and soreness on palpation in the right iliac region appeared. She was rushed to the operating room. Postoperative diagnosis: Terminal ileitis, secondary mesadenitis, secondary serous peritonitis. Further treatment was continued in the department of anesthesiology-resuscitation: infusion therapy, antibiotic therapy (meronem 60 mg/kg/day IV, vancomycin 40 mg/kg/day IV, metrogyl 22.5 mg/kg/day IV cap.), analgesia promedol.

The postoperative period was difficult. On the second day after the operation, pain appeared in the back of the neck, hyperesthesia, stiffness of the occipital muscles, a positive symptom of Kernig, hyperthermia + 38.0C. The phenomena of respiratory failure increased, tachycardia appeared up to 137 per minute, tachypnea up to 34 per minute, a decrease in SpO<sub>2</sub> to 85% against the background of oxygen therapy, oliguria 0.5 ml/kg/h.

On MSCT of the chest organs, infiltrative changes in the lungs were found on both sides of the polysegmental volume (more on the left), the percentage of damage is about 40%. In blood tests - a small leukocytosis l/c -  $9.3 \times 10^9/l$ , a pronounced shift in the leukocyte formula to the left to young forms, thrombocytopenia t/c -  $125 \times 10^9/l$ , CRP - 145 mg/l, procalcitonin test - more than 10 ng/ml.

From the additional anamnesis, it was found out that the girl about 3 weeks ago before the disease was in contact with her grandmother, who was treated at home with community-acquired pneumonia of covid etiology. In parents: dad has ELISA on SARS-CoV-2, the determination of total IgM + IgG antibodies to SARS-CoV-2 (COVID-19) is positive, KP - 5.26, in mom ELISA on SARS-CoV-2, the determination of total IgM + IgG antibodies to SARS-CoV-2 (COVID-19) is positive, KP - 2.21.

Anti-shock infusion therapy was started, diflucan 5 mg/kg/day intravenously, dopamine 0.5% - 10 µg/kg/min and oseltamivir 75 mg orally were added to the treatment, the patient was transferred to a ventilator (Newport - 360 in SIMV mode: f 20 in min, FiO<sub>2</sub> 80%, PIP 25 mbar, PEEP 5mbar). To exclude the course of neuroinfection, a lumbar puncture was performed: cerebrospinal fluid is transparent, flows

out at a rate of 40 - 50 caps. per minute, (protein 0.373 g/l, cytosin 53/3 in ml, erythrocytes 8/3 in ml, neutrophils - 73.6%, lymphocytes - 9.4%, eosinophils - 1.9%, monocytes - 3.8%, macrophages - 1.9%).

Over the next three days, the condition remained severe, with episodes of deterioration of the condition against the background of the clinical and laboratory manifestation of the syndrome of multiple organ failure: the need for ventilation, cardiotoxic support, episodes of oliguria. Postoperative intestinal paresis against this background persisted much longer than usual, which required a transition to complete parenteral nutrition. In used blood tests, there was an increase in urea to 29.57 mmol/l, creatinine to 167.9  $\mu$ mol/l, ALT to 60.2 U/l, AST to 89.9 U/l, proteinuria 1.3 g/l was noted.

On the control Rg gram - a sharply negative trend in comparison with the previous study: the syndrome of the "white chest", bilateral hyperdense consolidation of lung tissue by the type of infiltration in the "shock lung".

The deterioration of the condition is regarded as a manifestation of the "cytokine storm" against the background of the new coronavirus infection COVID-19, severe pneumonia with the development of a systemic inflammatory response and multiple organ failure. A decision was made to correct the treatment: dexamethasone 12 mg x 2 r/day iv drip, heparin 100 mg/kg/h, lasix 1.0 ml intravenously every 4 hours, limiting the daily volume of fluid to 70%.

Due to negative PCR results for COVID-19 (twice), blood was taken for ELISA for total Ig M + Ig G antibodies for COVID-19. ELISA result (positive - 2.2). Also, to determine the phase of the course of coronavirus infection, a blood test for IgM antibodies (negative) was taken.

On the fifth day of stay in the intensive care unit, a telemedicine consultation was held with the multidisciplinary medical council of the Irkutsk Regional Children's Clinical Hospital (IODKB). According to the results of the consultation, the diagnosis was made: Multisystem inflammatory syndrome associated with a new coronavirus infection (SPON, abdominal syndrome, serous meningitis, peritonism, polyserositis, RDS, DN 3 tbsp., acute heart failure, renal damage).

Correction of treatment was carried out: meronem in/in - continuation of the course of treatment; vancomycin, diflucan, cycloferon, oseltamivir have been canceled; Dopamine infusion was continued at a dose of 5 - 7  $\mu$ g/kg/min, therapy with heparin 80 U/kg/h was continued continuously under the control of coagulogram indicators, intravenous dexamethasone at the rate of 10 mg/m<sup>2</sup> in a single dose, from the next day in 2 intravenous administrations to 14 days with an assessment of the clinical effect; infusion of VVIG (2 g/kg was performed). Parameters of ventilation in the SIMV mode: f 20 per min, PIP 25 mbar, PEEP 5 mbar, it was gradually possible to reduce FiO<sub>2</sub> from 100% to 40%. The calculation of infusion therapy was carried out and repeatedly adjusted taking into account the indicators of central and peripheral hemodynamics.

On the 10<sup>th</sup> day of being in intensive care, the girl was transferred to spontaneous breathing with the supply of moistened oxygen through nasal cannulas, cardiotoxic support was canceled. On 28.12.2020, against the background of stabilization of the condition, cancellation of respiratory therapy, resumption of enteral nutrition, the girl was transferred by air transport to the intensive care unit of the IODKB, accompanied by an air ambulance team. At the time of the transfer, general clinical and biochemical laboratory parameters had returned to normal values. In the intensive care unit, the patient was treated for 11 days.

In the IODKB, the patient was about the developed carditis, as a consequence of the transferred coronavirus infection, from where she was discharged home with recovery.

### Case No. 2

Patient S., 2 years old, delivered on 08.02.2021. to the infectious diseases department of the Bratsk Children's City Hospital.

From the anamnesis: According to the parents, the boy has been ill since 05.02.2021, when the liquid stool appeared. From 06.02.2021. increase in temperature to + 38.5C, repeated vomiting. In the group of kindergarten quarantine according to OKI (norovirus infection from 06.02.2021-12.02.2021). According to the severity of the condition, he was hospitalized in the department of anesthesiology and resuscitation. Due to the increase in symptoms of DN, the child was transferred to a ventilator.

In clinical blood tests, a stab shift, thrombocytopenia, a decrease in hemoglobin were noted, which was corrected by replacement therapy. In biochemical blood tests - hypoproteinemia, increased creatinine to 126, 2 mmol/l, urea to 20.9 mmol/l, CRP to 236.3, increased activity of transaminases. In the coagulogram, signs of hypocoagulation were noted, restored by the patient's discharge. Indicators of CSC against the background of correction by the parameter of ventilation and infusion therapy did not change significantly from normal values.

In addition to the standard laboratory examination, a test for COVID-19 was carried out: PCR test negative, blood test for total antibodies to COVID-19 negative, lactate dehydrogenase - 714 units/l, triglycerides - 1.43 mmol/l, ferritin 265.2 µg/l.

Radiograph of OGK: on the right focal-infiltrative zones of consolidation of polysegmental volume, subtotal on the left, concomitant picture against the background of unstrained hydrothorax.

Ultrasound of the abdominal organs: echo-signs of hepatosplenomegaly. Diffuse changes in the parenchyma of the liver and pancreas. Echo-signs of inflammation of the kidney parenchyma with increased LSC in the arteries, and signs of moderate swelling of the adrenal glands and kidney parenchyma. Indirect signs of sepsis?

MSCT of the abdominal organs: a picture of a diffuse decrease in the densitometric parameters of the liver. Suspicion of the presence of free fluid in the left subdiaphragmatic space, the picture may be due to artifacts.

Diagnosis is basic: Multisystem inflammatory syndrome associated with a new coronavirus infection.

Complications of the underlying disease: Multiple organ failure syndrome, abdominal syndrome, polyserositis, RDS, DN 3 tbsp., acute heart failure, renal damage.

Concomitant diagnosis: Anemia of mixed genesis of 1 degree of severity.

Treatment was carried out according to the previously worked out method: ventilation, infusion therapy with elements of parenteral nutrition I, albumin 10%, transfusion of blood products (NWPC, EMOLT), meronem 60 mg/kg/day intravenously, vancomycin 40 mg/kg/day intravenously, immunovenin 25.0 ml No. 3, dopamine 0.5% 10 µg/kg/min, dexamethasone 10 mg/m<sup>2</sup>/day, heparin 4 - 10 U/kg/h VSK, Ignited in/in 20 g/per course, Lasix 0.5 - 1 mg/kg/day, omez 1 mg/kg/day.

During his stay in intensive care, telemedicine consultations with regional children's specialists were held twice.

17.02.2021 The child's condition stabilized, transferred to an auxiliary mode of ventilation with a supply of 30% oxygen.

In the intensive care unit, he was treated for 9 days, from where he was transferred for further treatment to the intensive care unit of GBUZ IGODKB, accompanied by a team of resuscitators of the OEXMP GBUZ IGODKB by a special air ambulance flight. From the IODKB, the patient was discharged home with recovery.

### **Case No. 3**

Patient I., 5 years old, was admitted to the infectious diseases department of the OGBUZ "Bratsk Children's City Hospital" on 18.04.2021. from the Zheleznogorsk CRH with DS: Acute intestinal infection. Crohn's disease? Acute abdomen?

From the anamnesis: fell ill on 23.03.2021, there was a liquid stool for 1 day. On 29.03.2021, I turned to the local pediatrician about persistent abdominal pain, treatment was prescribed. She was hospitalized in the infectious diseases department of the Zheleznogorsk CRH, where she received antibiotic therapy (ceftriaxone, amikacin). Discharged with improvement on 12.04.2021. In connection with the appearance with hyperthermia, loose stools, abdominal pain, she was re-hospitalized in the Zheleznogorsk CRH on 16.04.2021. However, against the background of the ongoing treatment (vancomycin, metronidazole, furazolidone), the condition did not improve. On 18.04.2021, it was decided to transfer the patient to the Fraternal Children's City Hospital.

The condition upon admission is severe, complaints of abdominal pain, repeated vomiting, loose stools, hard breathing in the lungs, no wheezing. Heart tones 28 in min., heart rate 160 in min., BP 101/72 mm Hg. The abdomen is swollen, it is involved in breathing, with palpation - soft, soreness in the right parts and above the womb, deep palpation is not available due to sharp bloating.

Upon admission, an ultrasound of the abdominal organs was performed: echo signs of an interintestinal abscess of the abdominal cavity (appendicular infiltrate in the pelvic location?). Free fluid in the abdominal and pleural cavities. After the surgeon's examination, the DS is exposed: Abscess of the abdominal cavity and small pelvis?

Lower median laparotomy, revision of the abdominal cavity, is performed. Postoperative DS: Acute mesenteric lymphadenitis. Serous peritonitis colitis.

On 20.04.2021, in connection with the increase in symptoms of respiratory failure, the patient was transferred to a ventilator. On the overview R-gram of the chest organs there are foci of bilateral hyperdense consolidation of lung tissue, with tendency to fusion, with perivascular peribronchial compaction of the pulmonary interstitium and the root homogenizing edematous component.

Inflammatory changes were also noted in the general blood test (leukocytosis, stab-nuclear shift in the leukocyte formula, high ESR). B/c blood disorders were characterized by violations of the water-electrolyte balance, hypoalbuminemia, increased creatinine, CRP. Parameters of KSHS - with minor deviations from the norm. In the coagulogram, there was a decrease in the level of fibrinogen. The values of the procalcitonin dough ranged from 0 to 0.5 ng/ml.

Blood test of the girl's mother for antibodies to COVID-19 ELISA from 20.04.2021: IgM 14.7 (positive); IgG 1.4 (positive).

The girl's blood test for antibodies to COVID-19 ELISA: IgM and IgG are negative. Swab from the throat for influenza virus A, B from 21.04.2021 oppose.

Analysis of feces for rotavirus, norovirus from 22.04.2021 positive.

Final clinical diagnosis: Multisystem inflammatory syndrome associated with a new coronavirus infection (multiple organ failure syndrome, abdominal syndrome, peritonism, polyserositis, DN grade 3, acute heart failure, acute renal failure).

Against the background of the treatment (meronem 60 mg/kg/day, vancomycin 40 mg/kg/day, metronidazole 22.5 mg/kg/day, heparin 5 - 10 U/kg/day, dexamethasone 10 mg/day, dopamine 5 µg/kg/min, immunovenin 25 ml x 2 p, octagam 10% 300 ml, albumin 10%), the condition stabilized, 28.04.21 children were transferred to spontaneous breathing.

On 30.04.2021. against the background of stabilization of the condition, complete restoration of respiratory functions, resumption of enteral nutrition, the patient was transferred to the infectious diseases department. The duration of stay in the intensive care unit was 12 days. Subsequently, the girl was transferred to the cardiology department of the IODKB, from where she was discharged home with recovery.

## **Results and Discussion**

A multisystem inflammatory response to a previous coronavirus infection can occur with clinical manifestations of various diseases (In our cases, pneumonia, peritonitis and meningitis), which causes certain difficulties with diagnosis and requires an extended differential diagnosis. Symptoms of an “acute abdomen” are a frequent occurrence in COVID-19 disease. This contributes to active surgical tactics in relation to these patients.

It should be remembered that the sensitivity of the PCR test for coronavirus decreases over time, and after 15 days from the onset of the disease, coronavirus infection, as a rule, gives a negative result. A negative PCR test for coronavirus does not exclude the possibility of the presence of this infection in a patient, as well as the development of serious complications against its background. Therefore, we consider it necessary to include in the standard of examination of patients with unclear epidanamnesis in the compulsory health insurance system, if COVID-19 is suspected and the presence of multiple organ failure syndrome, the blood test of patients for antibodies to SARS-CoV-2 (COVID-19) by Elisa method.

## **Conclusion**

1. If a multisystem inflammatory response is suspected in a patient, in difficult cases, it is necessary, in addition to a nasopharyngeal smear of PCR for COVID-19, to use additional diagnostic methods that are not included in the standard of examination (ELISA of blood for antibodies to SARS-CoV-2 COVID-19).
2. To identify an epidemiological contact, it is also necessary to screen the child’s closest relatives for COVID-19.
3. Daily monitoring, consultations and timely teleconsultations with specialists of higher-level hospitals contribute to the development of correct tactics and timely correction in the treatment of patients with the “cytokine storm” syndrome, which can develop against the background of a multisystem inflammatory syndrome in children after suffering COVID-19 infection.

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**Volume 6 Issue 1 January 2023**

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