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Successful treatment of a severe course of coronavirus infection in the obese polymorbid patient after bariatric surgery

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ABSTRACT

We presented a clinical case of the successful treatment of a severe course of polysegmental pneumonia caused by the novel coronavirus infection, that developed in the postoperative period after bariatric surgery in the patient with morbid obesity, comorbid type 2 diabetes mellitus, ischemic heart disease, arterial hypertension, pulmonary embolism (in past medical history), and stage 3 chronic obstructive pulmonary disease.

The given clinical case demonstrates the possibility of successful treatment of coronavirus infection in the polymorbid patient at an extremely high risk of an unfavorable outcome, given timely diagnosis, combination therapy using drugs that block cytokine storm, and strict adherence to clinical recommendations.

Keywords: morbid obesity, coronavirus infection, bariatric surgery, cytokine storm, tocilizumab

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Успешное лечение тяжелого течения коронавирусной инфекции у поликоморбидного пациента с ожирением после бариатрической операции

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РЕЗЮМЕ

Представлено клиническое наблюдение успешного лечения тяжелого течения полисегментарной пневмонии коронавирусной этиологии, развившейся в послеоперационном периоде бариатрической операции у пациента с морбидным ожирением, сопутствующим сахарным диабетом 2-го типа, ишемической болезнью сердца, гипертонической болезнью, тромбоэмболией мелких ветвей легочной артерии в анамнезе, хронической обструктивной болезнью легких 3-й степени.

Приведенный клинический случай демонстрирует возможность успешного лечения коронавирусной инфекции у поликоморбидного пациента с крайне высоким риском неблагоприятного исхода при условии своевременной диагностики, комплексного лечения с использованием препаратов, блокирующих цитокиновый шторм, и строгого выполнения клинических рекомендаций.

Ключевые слова: морбидное ожирение, коронавирусная инфекция, бариатрическая хирургия, цитокиновый шторм, тоцилизумаб

Конфликт интересов. Авторы декларируют отсутствие явных и потенциальных конфликтов интересов, связанных с публикацией настоящей статьи.

Источник финансирования. Авторы заявляют об отсутствии финансирования при проведении исследования.

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INTRODUCTION

The COVID-19 pandemic has been a huge shock, but we should not forget about another epidemic of the 21st century – obesity. An obese patient is always a polymorbid patient. As a rule, their diagnosis includes: type 2 diabetes mellitus, arterial hypertension, hypertriglyceridemia or dyslipidemia, obstructive sleep apnea, and non-alcoholic fatty liver disease. Since the beginning of the pandemic, obesity has been regarded as a predictor of a high risk of developing severe pneumonia, acute respiratory distress syndrome (ARDS), thromboembolic complications (TEC), and death [1–4].

In obesity, the springboard for viral damage is an initially elevated level of proinflammatory cytokines, including interleukin (IL)-6, tumor necrosis factor (TNF)-α, C-reactive protein (CRP), and ferritin, which leads to a higher risk of developing cytokine storm, ultimately leading to ARDS, shock, and rapid deterioration [4–8]. Activation of the coagulation cascade in COVID-19 in obese patients has a higher risk of fatal thromboembolic complications against the background of hypercoagulability [7]. Obesity leads to a decrease in the reserves of the respiratory system, microatelectases, violation of the ventilation / perfusion ratio, dysfunction and limited excursions of the diaphragm, and an increase in the work of the respiratory muscles with a rise in oxygen consumption. Timely identification of signs of an increased inflammatory response and inclusion of drugs that block cytokine storm in complex therapy are the key to successful treatment. These drugs include, in particular, glucocorticoids, inhibitors of IL-6 and IL-1β receptors, and Janus kinase inhibitors [8, 9].

CLINICAL CASE

Patient P., 58 years old, was admitted for bariatric surgery on 12.10.2020 to the surgical department of a clinic with a diagnosis of morbid obesity (BMI 44.4 kg / m^2), exogenous constitutional type. Obstructive sleep

apnea syndrome. Type 2 diabetes mellitus. The target HbA1c level was less than 6.5%. Diabetic sensorimotor peripheral polyneuropathy. Cardiovascular autonomic neuropathy in diabetes. Diabetic macroangiopathy (atherosclerosis of the brachiocephalic arteries). Ischemic heart disease. Postinfarction cardiosclerosis (of unknown age). Stage III hypertension, stage II arterial hypertension, risk group 4. Pulmonary embolism (small branches, 2008). Stage I chronic heart failure (CHF). Functional class I (NYHA). Dyslipidemia. Stage 3 chronic obstructive pulmonary disease (COPD), emphysematous type, severe course, group C (with frequent exacerbations), stable condition. Type 2 respiratory failure. Compensated chronic cor pulmonale. Varicose veins of the lower extremities, CEAP class 2. Gastroesophageal reflux disease (GERD), without exacerbation. Polymerase chain reaction (PCR) to detect SARS-CoV-2 in the pharyngeal and nasal swabs upon admission was negative.

On 13.10.2020, laparoscopic mini-gastric bypass was performed. The early postoperative period was uneventful; the patient was activated, the intake of fluids and nutrition was started according to the postoperative protocol for bariatric interventions, antibiotic prophylaxis with cefazolin 3 g / day and TEC prophylaxis with enoxaparin sodium 0.4 ml / day were carried out. On 17.10.2020, a rise in temperature to 38.5 °C, without symptoms of catarrh, and a decrease in oxygen saturation to 89–90% were recorded. The patient's condition was regarded as moderate. Nasal and oropharyngeal swabs were taken for SARS-CoV-2 detection using PCR.

The patient was transferred to the intensive care unit. A blood gas test revealed hypoxemia (P_{O2} 62 mm Hg) compensated by hyperventilation (pH 7.48, P_{CO2} 29.1 mm Hg, BEecf 2 mmol / l). Insufflation of humidified oxygen via a face mask at a rate of 3 l / min was started, antibacterial therapy included cefoperazone + sulbactam 2.0 g / day and levofloxacin 1.0 g / day; prevention of thrombus formation was achieved by enoxaparin sodium 0.8 ml / day; dexamethasone 24 mg / day; inhaled bronchodilator therapy was continued (berodual 2 times / day, budesonide 2 times / day, Spiolto Respimat 2 times / day); gastroprotectors – esomeprazole 40 mg / day, correction of hyperglycemia with short-acting insulin.

Taking into account pronounced abdominal obesity, the patient was lying alternately on the right and left sides, in a position close to the prone position. At the slightest improvement in the patient's condition, attempts to activate and improve the motor regime were resumed. Taking into account the increase in hypoproteinemia, the standard diet for the bariatric patient was supplemented with Nutrison Advanced Diason via sip feeding. Intravenous fluids were limited to saline to dilute the administered drugs.

On 19.10.2020, positive PCR results for SARS-CoV-2 were obtained in the oropharyngeal and nasal swabs taken on 17.10.2020. Computed tomography was not performed for technical reasons, X-ray revealed no deterioration. A competing diagnosis was made: novel coronavirus infection COVID-19, confirmed by PCR, severe course.

From 23.10.2020, there was an increase in respiratory failure and a rise in oxygen demand up to 8–10 l / min. From 25.10.2020, there was increased dyspnea, a feeling of breathlessness, a decrease in Sp_{O2} to 83% against the background of oxygen insufflation of 15 l / min. Increasing hypoxemia (Pa_{O2} 58–60 mm Hg, oxygenation index 125–130) was observed. The patient was in a clear consciousness and adequate. Hemodynamic parameters were characterized by a tendency toward hypotension. During X-ray control of 25.10.2020, bilateral polysegmental pneumonia was noted, multiple areas of veil-like ground-glass opacity were observed in all lung fields. Laboratory tests revealed signs of cytokine storm – the progression of lymphopenia, an increase in the levels of C-reactive protein and ferritin. The levels of procalcitonin, troponin I, and brain natriuretic peptide were within the reference values. The diagnosis included a complication of the competing disease: Bilateral polysegmental pneumonia. ARDS. Acute respiratory failure.

Taking into account the clinical presentation, the initial status of the patient, and signs of increasing cytokine storm on 25.10.2020, an infusion of tocilizumab 560 mg (4 mg / kg) was performed. There was a short-term improvement immediately after the infusion. On 26.10.2020, there was a resumption of dyspnea upon minimal physical exertion, Sp_{O2} 87–89% against the background of oxygen insufflation 15 l / min, and further increase in arterial hypoxemia (Pa_{O2} up to 55 mm Hg, oxygenation index 100–110). Repeated infusion of tocilizumab at the same dose was performed; antibacterial therapy was changed to imipenem + cilastatin 3 g / day and vancomycin 2 g / day. Under the control of coagulation tests and thromboelastography indices, the dose of enoxaparin was increased to 1.6 ml / day.

Against this background, a decrease in the manifestations of respiratory failure was noted: there was a significant decrease in dyspnea and oxygen demand,

from 30.10.2020, the patient did not require oxygen support, and improvement in laboratory parameters was also observed. On 30.10.2020, due to a re-positive PCR result for SARS-CoV-2 (sampling on 27.10.2020), etiotropic therapy with favipiravir 1,800 mg 2 times / day on the 1st day, then 800 mg 2 times / day was started. The changes in the main clinical and laboratory parameters are presented in Table.

Table

Dynamics of clinical and laboratory parameters

Parameter	19.10	21.10	23.10	25.10	26.10	27.10	28.10	29.10	31.10	02.11
Leukocytes, 10^9 / l (4.00–10.00)	4.17	5.21	8.93	9.30	5.86	5.37	5.92	5.81	7.46	5.32
Lymphocytes, % (20–40)	16.6	13.1	2.3	5.5	9.3	8.4	10.4	11.9	6.8	9.9
Lymphocytes, *10^9 / l (0.8–4.0)	0.7	0.68	0.2	0.52	0.55	0.45	0.61	0.69	0.51	0.53
Platelets, *10^9 / l (100–300)	181	183	216	265	279	339	372	334	348	300
ESR, mm / h	15	21	29	31	38	27	24	18	7	7
CRP, mg / l (0–5)	34.1	34.9	43.9	72.7	91.6	33.3	12.9	5.4	2.1	0.8
Ferritin, µg / l (20–250)	281.7	317.8	343.0	379.8	465.4	460.3	374.1	330	348.3	316.8
D-dimer, ng / ml (200–443)	365	273	244	283	349	394	319	302	336	267
Fibrinogen, g / l (2.0–4.0)	5.8	4.3	4.9	5.3	5.1	4.1	3.8	3.5	2.9	2.4
SpO_2, %, minimum	91	87	86	81	87	86	89	90	93	94
Respiratory rate, maximum	18	19	16	28	26	20	20	23	18	16

On 03.11.2020, the patient was transferred from the intensive care unit to the observation unit. The PCR result of 05.11.2020 was negative. The patient was discharged from the clinic on 09.11.2020.

CONCLUSION

This clinical case demonstrates the possibility of successfully treating severe coronavirus infection in a patient with an extremely high risk of an unfavorable outcome. Timely diagnosis, targeted pathogen-specific therapy, strict adherence to clinical guidelines, and timely administration of tocilizumab in combination with dexamethasone allowed to prevent fatal decompensation of respiratory failure and avoid transfer to mechanical ventilation. The prescription of antibiotic therapy, despite the negative bacterial cultures of sputum and blood, was justified given the concomitant diabetes mellitus and COPD, on the one hand, and massive immunosuppressive therapy, on the other.

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