

# Complications After Covid - 19 Combined With Pneumonia

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**Relevance.** The COVID-19 virus infection, which has been classified as a pandemic by WHO, is caused by a representative of the group of coronaviruses, which, in turn, belong to the family of seasonal SARS. The SARS-CoV-2 disease, dubbed COVID-19, was officially declared a pandemic by the World Health Organization on March 11, 2020. SARS-CoV-2 contains a single-stranded positive-sense RNA genome surrounded by an extracellular membrane containing a series of crown-like spike glycoproteins.

An increase in the number of acute lung abscesses, pleural empyema, high disability and mortality necessitate the search for new methods of diagnosis and treatment. Despite advances in the treatment of pulmonary destruction, mortality remains high, and in complicated forms there is a high percentage of deaths. Therefore, the search for new approaches to the diagnosis and treatment of pyoinflammatory lung diseases is relevant today.

**Materials and research methods.** The data of the examination and treatment of 74 patients with moderate severity of the course of COVID-19, who were treated from July to August 2020 in a specialized hospital formed for the treatment of patients with COVID-19 by the Bukhara State Medical Institute in the dormitory of the Bukhara Technological Institute, were analyzed. When assessing the condition and method of treatment, we were guided by temporary recommendations for the management of patients infected with COVID-19 - No. 7 approved by the Ministry of Health of the Republic of Uzbekistan dated 15.08.2020. According to the protocol, patients with COVID - 19 are divided into 4 groups depending on the severity of the disease. The protocol provides specific recommendations on the scope of examination and treatment, taking into account the severity of the patient's condition.

**Conclusions.** When assessing the condition of patients with COVID-19 associated pneumonia, indicators of intoxication, blood coagulation and SpO<sub>2</sub>% of blood are important. The main criteria for assessing the state of the coagulogram in COVID-19 are: D-dimer; PV; platelets; Fibrinogen blood.

**Key words:** COVID - 19, SARS-CoV-2, covid 19 - associated pneumonia.

The COVID-19 virus infection, which has been classified as a pandemic by WHO, is caused by a representative of the group of coronaviruses, which, in turn, belong to the family of seasonal SARS.

The SARS-CoV-2 disease, dubbed COVID-19, was officially declared a pandemic by the World Health Organization on March 11, 2020. SARS-CoV-2 contains a single-stranded positive-sense RNA genome surrounded by an extracellular membrane containing a series of crown-like spike glycoproteins [2,3].

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Imaging techniques such as plain chest X-ray and computed tomography (CT) are important tools in the evaluation of patients with chronic obstructive pulmonary disease (COPD) of any etiology. These methods facilitate the differential diagnosis and assessment of individual lung pathologies, such as the presence of emphysema, bullae, or fibrosis [4,8].

COVID-19 induced hypercoagulability is explained by endothelial cell dysfunction, which in turn leads to excessive thrombin formation and a decrease in fibrinolysis activity [4]. The ability of coronaviruses to penetrate directly into the bone marrow and disrupt hematopoiesis cannot be ruled out [5].

Coagulation disorders lead to thrombotic complications that are clinically significant. The resulting microthrombosis, disrupting microcirculation, can significantly aggravate the course of acute respiratory failure in patients with COVID-19. Therefore, the treatment of COVID-19 must necessarily include measures aimed at correcting hemostasis disorders [6,8]. The analysis of literature sources shows that the

COVID-19 pandemic has complicated the treatment of lung diseases. There is currently insufficient evidence that any existing antiviral drugs can effectively treat COVID-19 pneumonia [1,7].

Despite advances in the treatment of pulmonary destruction, mortality remains high, and in complicated forms there is a high percentage of deaths. Therefore, the search for new approaches to the diagnosis and treatment of pyoinflammatory lung diseases is relevant today.

Of the 74 examined patients, 68 (66.6%) were men, 34 (33.4%) women, aged 17 to 76 years (mean age was  $48.4 \pm 2.1$  years). All examined patients on the day of admission, urgently started complex therapy for the treatment of COVID - 19, drugs based on Protocol No. 7 recommended by the Ministry of Health of the Republic of Uzbekistan.

From the moment of admission, all patients were measured body temperature, respiratory rate, an objective examination of the lungs (auscultation, percussion), pulse oximetry, X-ray examination of the lungs, and, if necessary, MSCT of the chest. When collecting an anamnesis, attention was focused on determining the duration of the disease and the contact of patients with patients with COVID-19. To determine the level of oxygen saturation of the capillary blood of the body, the SpO<sub>2</sub>% index was studied using a pulse oximeter apparatus by fixing the apparatus to the end of the phalanx of the patient's hand.

All admitted patients from the day of hospitalization and in dynamics were determined indicators of body temperature and blood intoxication: blood leukocytes, LII, MSM, blood ESR. The indicators of D - dimer were studied; prothrombin time; platelets; blood fibrinogen.

**Results and discussions.** All examined patients were admitted with COVID - 19 associated pneumonia, which was confirmed by radiological examination. As noted above, patients on the day of admission on an emergency basis began conservative therapy in accordance with the temporary recommendations for the management of patients infected with COVID-19 No. 7. From the moment of admission, all patients underwent - taking a swab from the nasopharynx to verify the diagnosis using the polymerase chain reaction (PCR) method for COVID-19, regardless of clinical manifestations, detection of specific antibodies in the blood (IgA; IgM and / or IgG) to SARS -CoV-2, thermometry, respiratory rate was measured. An objective examination of the lungs (auscultation, percussion), pulse oximetry, X-ray examination of the lungs, and, if necessary, MSCT of the chest were performed. Taking into account the results of clinical and radiological studies, all patients, if necessary, underwent oxygen therapy using the CPAP or Bobrov apparatus. The effectiveness of treatment was assessed by the dynamics of the results of clinical and X-ray studies (X-ray, MSCT). The condition of the lung tissue and the assessment of the degree of lung damage were assessed by MSCT or X-ray studies. The main criterion for the treatment of COVID-19 was the results of a PCR study from the nasopharynx for COVID-19 and the detection of antibodies to SARS-CoV-2 in the blood. Important indicators for assessing the condition of patients were the results of a study of indicators of blood intoxication: blood leukocytes, LII, MSM, blood erythrocyte sedimentation rate, indicators D - dimer; PV; platelets; Blood fibrinogen and MSCT of the lung in dynamics. Analysis of laboratory indicators of intoxication in the examined patients revealed the following changes (Table 1). As shown in the table, on the first day of treatment, the body temperature of patients averaged  $38.01 \pm 0.30$ . The content of blood leukocytes was on average  $8.21 \pm 0.11 \times 10^9/l$ . The volume of MSM is  $0.178 \pm 0.017$  units. Similarly, there was an increase in LII and ESR. Table 1

Dynamics of indicators of intoxication in examined patients with COVID - 19 associated pneumonia (n = 74).

indicators	Time of observation			
	Admission day	3 day	7 day	14 day
t <sup>0</sup> body	$38,01 \pm 0,30$	$37,25 \pm 0,17^{***}$	$36,9 \pm 0,14^{***}$	$36,70 \pm 0,21$
L blood $\times 10^9/l$	$8,21 \pm 0,11$	$7,18 \pm 0,17^{***}$	$6,37 \pm 0,32^*$	$7,78 \pm 0,18^*$

MSM unit	0,178±0,017	0,152±0,09	0,14±0,023**	0,131±0,003*
LII unit	1,69±0,12	1,28±0,05	1,0±0,03**	1,0±0,03
ESR mm/h	52,71±2,50	44,43±1,14	35,65±2,18*	26,21±2,14***

Note: \* - reliability of the difference relative to the data of the previous day significant (\* - P<0.05, \*\* - P<0.01, \*\*\* - P<0.001).

On the third day of treatment, there was a slight decrease in body temperature to 37.25±0.17, the number of blood leukocytes decreased to an average of 7.18±0.17×10<sup>9</sup>/l. The volume of medium molecules averaged 0.152±0.09 units. There was a decrease in LII and ESR to 1.28±0.05 and 44.43±1.14, respectively.

By the seventh day of treatment, the examined patients remained slightly febrile (36.9±0.14). At the same time, for all laboratory indicators of intoxication of the body: L, MSM, LII and ESR of the blood, their further decrease was noted, that is, there was a tendency towards normalization - 6.37±0.32 × 10<sup>9</sup>; 0.140±0.023; 1.0±0.03; 35.65±2.18 respectively. By the fourteenth day of treatment, these indicators, although they tended to further normalization, remained above the norm. With further treatment and observation, by the seventh day, all analyzed indicators of intoxication, except for blood ESR, were within the reference values.

In the next, the condition of the patients was studied according to the indicators of pulse oximetry - SpO<sub>2</sub>%. Upon admission, patients showed a slight deviation of SpO<sub>2</sub> % from normal values, that is, 92.62±0.08% (Table 2).

**Table 2**  
Dynamics of pulse oximetry parameters of examined patients (n=74)

Indicator SpO <sub>2</sub> %				Normal SpO <sub>2</sub> % values according to WHO (2009). SpO <sub>2</sub> - 95% or higher
Day of admission	3 days	7 days	14 days	
92,62±0,08	93,74±0,13	94,24±0,32	96,10±0,36*	

Note: \* - reliability of the difference relative to the data of the previous day significant (\* - P<0.05, \*\* - P<0.01, \*\*\* - P<0.001).

Against the background of the therapy, pulse oximetry parameters SpO<sub>2</sub>% slowly tended to normalize. By the third day of treatment, the dynamic growth curve of SpO<sub>2</sub>% was insignificant. By the 6-7th day of treatment, there was a positive trend in SpO<sub>2</sub>%, reaching up to 94.24±0.32, which corresponds to the lower limit of normal. On average, the increase in oxygen saturation of tissues at this time reached up to 0.5% of the original. In the future, with a dynamic increase by the 14th day - up to 96.10±0.36, which significantly differs from the initial values by an average of 2.14%.

To verify the diagnosis of COVID - 19, as indicated above, all patients underwent a PCR study from the nasopharynx. It should be noted that 2% of patients at the time of admission had confirmed results of PCR testing for COVID-19. The rest of all patients underwent PCR testing for COVID-19 on the day of admission. According to the results of a PCR study, 45% of patients had a false positive test result for coronavirus, 55% of patients had positive PCR tests. Given the presence of clinical signs such as: anosmia, headaches, fever, patients in whom the PCR study showed a false negative or negative result, a diagnosis of COVID - 19 was established. All these patients had a history of contact with patients with COVID - 19 over the past 14 days prior to admission. 70% of patients in the family had patients with confirmed tests for COVID-19.

A dynamic study of hemostasis parameters of the examined patients revealed the following indicators: D-dimer on the day of admission was above the norm, which averaged 1544 ng/ml; The indicator of

prothrombotic time was - 14 sec; Platelets and Fibrinogen were above the norm  $222 \times 10^9/l$  and 4.4 g/l, respectively.

**Table 3**  
Hemostasis parameters in examined patients (n=74)

Indicator	Indicator in dynamics				
	Admission day	3 days	7 days	14 days	reference values
d-dimer	1544 ng/ml	958 ng/ml	554 ng/ml	325 ng/ml	0-500 ng/ml
prothrombin time	15 sec	13 sec	12sec	12 sec	11—16 sec
platelets	$222 \times 10^9/l$	$186 \times 10^9/l$	$177 \times 10^9/l$	$172 \times 10^9/l$	150 - $400 \times 10^9/l$
fibrinogen	4,4 g/l	4,2 g/l	4,1 g/l	4,1 g/l	2—4 g/l

Note: \* - reliability of the difference relative to the data of the previous day significant (\* -  $P < 0.05$ , \*\* -  $P < 0.01$ , \*\*\* -  $P < 0.001$ ).

Against the background of complex treatment with the use of heparin anticoagulants and low molecular weight heparins (Clexane, Enoxiparin), all these indicators gradually normalized in dynamics by the 7–8th day of treatment.

The main X-ray signs of COVID-19 associated pneumonia in the examined patients were the following symptoms: numerous ground-glass seals of the lung tissue, involving up to 25-40% of the lung parenchyma, occurred in 68 (66.6%) patients, similar to foggy compaction of the lungs, with preservation of the contours of the bronchi and blood vessels.

Less commonly, CT scans showed signs of: areas of consolidation, perilobular seals in 19 (18.6%) patients; air bronchogram symptom, traction bronchiectasis in 7 (6.8%) patients; pleural effusion, hydrothorax in 2 (1.9%) bilateral, predominant on the left. All these signs were mainly determined on the 6th–10th day of diseases.

In the process of complex treatment, synchronously with the improvement of the general condition and clinical and laboratory data of the examined patients, the CT picture also had a positive trend. By 7-8 days of treatment, in most cases, the examined patients had normal CT pictures, it should be noted that in 20-25% of patients at this period of treatment, CT scans showed residual effects of the x-ray picture..

**Conclusions:** When assessing the condition of patients with COVID - 19 associated pneumonia, MSCT picture, indicators of intoxication and SpO<sub>2</sub>% of blood are important. The main criteria for assessing the state of the coagulogram in COVID-19 are: D-dimer; PV; platelets; Fibrinogen blood.

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