

## MEDICINE AND PHARMACY

# Predictors of adverse course of COVID-19 in patients with acute abdominal surgical pathology

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**Abstract.** The continuous wave-like morbidity increasing of coronavirus disease in 2019 (COVID-19), the emergence of different strains of the virus has contributed to the search for new ways in diagnostic algorithms and methods of treatment of such patients. Expert opinion of the International Society of Thrombosis and Haemostasis on the predictors of adverse COVID-19 encourages the search for modern ways to determine the degree of coagulopathy. Determination of prothrombin time clearance, D-dimer and platelet count in patients, whom was performed surgery, is one way to stratify the risk of venous thromboembolism. The results of surgical treatment of 504 patients in the surgical center of Lviv Emergency Medical Hospital for the 2019–2021 were analyzed. Slightly dominated by man – 52.7%. The age of patients ranged from 21 to 85 years (mean – 62.1±21.2). As a result of the scientific study, 36 (7.14%) patients operated on with abdominal pathology and confirmed diagnosis of COVID-19 were analyzed in detail. 27 (23.1%) patients were in the intensive care unit, 14 of them (51.8%) with invasive lung ventilation – 11 (78.6%), the average bed-day in intensive care was 7.2 days. 14 (38.9%) patients died, and autopsies were performed in 13 (92.8%). Cause of death: multiple organ failure, pulmonary embolism, septic complications. Introduction. The continuous wave-like morbidity increasing of coronavirus disease in 2019 (COVID-19), the emergence of different strains of the virus has contributed to the search for new ways in diagnostic algorithms and methods of treatment of such patients. Since December 2019, more than 240 million patients and 4.8 million deaths caused by coronavirus SARS-CoV-2 have been registered, a third of whom, according to many authors, have been diagnosed with thrombosis in various locations. The development of coagulopathy and ICE syndrome in coronavirus-infected surgical patients is a special problem, because cytokine distress, hypoxia, endothelin dysfunction, hypercoagulation, thrombosis are potentiated [1,3,6,8]. Expert opinion of the International Society of Thrombosis and Haemostasis (ISTH) on the predictors of adverse COVID-19 encourages the search for modern ways to determine the degree of coagulopathy. Determination of prothrombin time clearance, D-dimer and platelet count in patients, whom was performed surgery, is one way to stratify the risk of venous thromboembolism (VT). And some publications on septic coagulopathy

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[2,3,5,6,7] additional monitoring of fibrinogen levels, especially their reduction, may be useful in calculating thrombosis risks in surgical patients with coronavirus disease. The aim of the study was to establish the diagnostic value of thrombosis markers in patients with acute abdominal surgical pathology infected coronavirus and to predict the course of the disease. The data of the study 1494 autopsies conducted in our clinic from 1990 to 2000 are noteworthy, as we note a certain change in the ratio of the causes of death of patients in a surgical hospital. Thus, during the SARS-CoV-2 pandemic, the predominant cause of death in patients with acute abdominal surgical pathology was respiratory failure and thromboembolic complications. However it should be noted that some caution of doctors who formulated the final diagnosis because more than half of the dead, sometimes unreasonably, in the concomitant diagnosis indicated pulmonary embolism. Taking into account the opinion of ISTH experts, we have studied certain indicators of coagulopathy during the postoperative period and created an algorithm for the management of patients with COVID-19. The D-dimers dynamics, total fibrinogen, prothrombin time and platelet count were evaluated and subjected to multifactorial analysis by multiple regression. Thus, the significant difference between the groups of recovered and dead was: for D-dimers - an increasing of 3.4 times ( $p=0.193$ ), for prothrombin time - an increasing of 2.3 times ( $p=0.454$ ), for fibrinogen - a decreasing of 2.1 time (0.491) and for platelets - a decreasing of 1.7 times ( $p=0.567$ ). According the studied data, the algorithm for predicting the unresponsive course of the postoperative period in patients with acute surgical abdominal pathology infected with coronavirus type SARS-CoV-2 was modeled. The risk group for fatal thromboembolic complications should include patients with significantly elevated D-dimer, prolonged thromboplastin time, platelet count  $< 100 \times 10^9/l$  and fibrinogen  $< 2$  g/l. In this case, in our opinion, it is advisable to use more aggressive therapeutic regimens, namely: observation in the intensive care unit, daily monitoring of coagulopathy, the use of therapeutic doses of anticoagulants and possible administration of blood products.

**Keywords:** COVID-19, abdominal surgical pathology, predictors.

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**Materials and methods.** The results of surgical treatment of 504 patients in the surgical center of Lviv Emergency Medical Hospital for the 2019–2021 were analyzed. Slightly dominated by man - 52.7%. The age of patients ranged from 21 to 85 years (mean -  $62.1 \pm 21.2$ ).

Criteria for inclusion in the study were: 1) patients with acute surgical abdominal pathology, whom surgery was performed within a day from the moment of hospitalization; 2) determination of D-dimers, platelet count, prothrombin time and fibrinogen during hospitalization; 3) the absence of clinical symptoms and instrumental signs of venous thrombosis at the time of hospitalization.

The structure of acute abdominal surgical pathology is presented in table 1.

The risk of venous thrombosis was assessed by J.A.Caprini [4] score, 72 (14.3%) patients were classified as low-risk of DVT, 201 (39.9%) and 231 (45.8%) as high risk. All patients received DVT prophylaxis according to the established degree

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of risk and in accordance with the existing recommendations and orders.

Table 1

**The structure of acute abdominal surgical pathology**

Disease	Complication	Patients	
		n	%
Acute intestinal obstruction	Abdominal adhesions	30	5,9
	Small intestine invagination	4	0,8
	Gallstone ileus	8	1,6
	Obstructive colon cancer	86	17,1
Acute apendicitis	Catarrhal	18	3,5
	Phlegmonous	36	7,2
	Gangrenous	42	8,3
	Periapendicular abscess	10	2,1
Squeezed hernia	Bowel resection	24	4,7
	Greater omentum resection	30	5,9
	Without resection	42	8,3
Гострый холецистит	Phlegmonous	30	6,0
	Gangrenous	38	7,5
	Perforated	14	8,7
Perforated ulcer	Gastric	44	8,7
	Duodenal	24	4,7
Perforated diverticulitis	Colon descendance	8	1,6
	Sigmoid colon	6	1,2
Mesenteric ischemia	With bowel resection	4	0,8
	Without bowel resection	6	1,2

Preoperative condition of patients was assessed according to the classification of ASA (The American Society of Anesthesiologists), as: class I - 62 (12.3%) patients, class II - 132 (26.2%), class III - 143 (28.4%), class IV - 101 (20.0%) and class V - 66 (13.1%). All surgery were performed within a day from the moment of hospitalization under general (74.2%) or epidural (25.8%) anesthesia. The average duration of the surgery was 98±51.8 minutes.

According the data of the study N.Tang [1,7] in which 71.4% of patients who died of COVID-19 diagnosed with DIC blood, considered in appropriate to determine the markers of hemostasis: D-dimer, total fibrinogen, prothrombin time - on an automatic analyzer HumaClot Pro (Germany) and platelet count - on an automatic analyzer Convergus X5 (Germany). The study was performed before surgery and 3-7 days after it.

As a result of the scientific study, 36 (7.14%) patients operated on with abdominal pathology and confirmed diagnosis of COVID-19 were analyzed in detail. 27 (23.1%) patients were in the intensive care unit, 14 of them (51.8%) with invasive

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lung ventilation - 11 (78.6%), the average bed-day in intensive care was 7.2 days. 14 (38.9%) patients died, and autopsies were performed in 13 (92.8%). Cause of death: multiple organ failure, pulmonary embolism, septic complications.

The data of the study 1494 autopsies conducted in our clinic from 1990 to 2000 are noteworthy, as we note a certain change in the ratio of the causes of death of patients in a surgical hospital. Thus, during the SARS-CoV-2 pandemic, the predominant cause of death in patients with acute abdominal surgical pathology was respiratory failure and thromboembolic complications. However it should be noted that some caution of doctors who formulated the final diagnosis because more than half of the dead, sometimes unreasonably, in the concomitant diagnosis indicated pulmonary embolism.

The issue of thrombosis overdiagnosis in covid-positive patients and unjustified use of anticoagulants in therapeutic doses, sometimes unreasonable potentiating the risk of massive bleeding in patients in the postoperative period, is debatable. This fact confirms the special attention of doctors in relation to venous thrombosis and requires further study.

Taking into account the opinion of ISTH experts, we have studied certain indicators of coagulopathy during the postoperative period and created an algorithm for the management of patients with COVID-19. The D-dimers dynamics, total fibrinogen, prothrombin time and platelet count were evaluated and subjected to multifactorial analysis by multiple regression. Thus, the significant difference between the groups of recovered and dead was: for D-dimers - an increasing of 3.4 times ( $p=0.193$ ), for prothrombin time - an increasing of 2.3 times ( $p=0.454$ ), for fibrinogen - a decreasing of 2.1 time (0.491) and for platelets - a decreasing of 1.7 times ( $p=0.567$ ).

According the studied data, the algorithm for predicting the unresponsive course of the postoperative period in patients with acute surgical abdominal pathology infected with coronavirus type SARS-CoV-2 was modeled. The risk group for fatal thromboembolic complications should include patients with significantly elevated D-dimer, prolonged thromboplastin time, platelet count  $< 100 \cdot 10^9/l$  and fibrinogen  $< 2$  g/l. In this case, in our opinion, it is advisable to use more aggressive therapeutic regimens, namely: observation in the intensive care unit, daily monitoring of coagulopathy, the use of therapeutic doses of

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anticoagulants and possible administration of blood products.

### Conclusions:

1. Covid-19 - a hard complication of the disease in patients with acute surgical abdominal pathology.

2. Coagulopathy and thrombosis are the main causes of death in such patients.

3. The study of markers of hypercoagulation is one of the promising areas through which we can predict the course of the disease during the postoperative period and develop a model of treatment of such patients.

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