



THE STATE OF THE HEMOSTASIS SYSTEM IN PATIENTS WITH COVID-19

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Annotation

Coronavirus infection (COVID-19) is an acute infectious disease caused by the SARS-CoV-2 virus and characterized by activation of the hemostasis system. As a result of this, severe conditions can develop, i.e. coagulopathy. It remains unclear whether COVID-19 is the direct cause of these conditions or whether they occur during the development of an infectious process. The incidence of asymptomatic and clinically evident thrombotic thromboembolic complications in COVID-19 remains unclear. This situation is largely due to the difficulties of diagnosis. However, according to some reports, the frequency of venous and arterial thrombosis in patients with COVID-19 is significantly higher. At the same time, the features of the course of the disease aroused interest in terms of searching and studying its causing factors and caused a lot of discussion.

Keywords: COVID-19, SARS-CoV-2, thrombotic thromboembolic complications, venous and arterial thrombosis.

COVID-19 KASALLIGIDA BEMORLAR GEMOSTAZ TIZIMI HOLATI.

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Annotatsiya

Koronavirus infeksiyasi (COVID-19), SARS-CoV-2 virusi keltirib chiqaradigan o'tkir yuqumli kasallik hisoblanib, gemostaz tizimining faollashishi bilan tavsiflanadi. Buning natijasida esa og'ir holatlar ya'ni koagulopatiya rivojlanishi mumkin. COVID-19 ushbu holatning bevosita sababimi yoki ular yuqumli jarayonning rivojlanishi bilan yuzaga keladimi, hozircha bu noaniqligicha qolmoqda. COVID-19 kasalligida simptomsiz va klinik jihatdan aniq bo'lgan trombotik, tromboembolik asoratlarning uchrash chastotasi noaniq bo'lib





qolmoqda. Bu holat ko'p jihatdan tashxislashdagi qiyinchiliklar bilan bog'liq. Biroq, ba'zi ma'lumotlarga ko'ra, COVID-19 bilan og'rig'an bemorlarda venoz va arterial trombozning chastotasi ancha yuqori. Ushbu holatda, kasallik kechishining o'ziga xos xususiyatlari, uni keltirib chiqaradigan omillarni izlash va ularni o'rganish nuqtai nazaridan qiziqish uyg'otdi va ko'plab munazaralarga sabab bo'ldi.

Kalit so'zlar: COVID-19, SARS-CoV-2, trombotik, tromboembolik asoratlar, venoz va arterial tromboz.

СОСТОЯНИЕ СИСТЕМЫ ГЕМОСТАЗА У БОЛЬНЫХ COVID-19

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Аннотация

Коронавирусная инфекция (COVID-19) — острое инфекционное заболевание, вызываемое вирусом SARS-CoV-2 и характеризующееся активацией системы гемостаза. В результате этого могут развиваться тяжелые состояния, т.е. коагулопатия. Остается неясным, является ли COVID-19 непосредственной причиной этих состояний или они возникают при развитии инфекционного процесса. Частота бессимптомных и клинически очевидных тромботических тромбоэмболических осложнений при COVID-19 остается неясной. Такое положение во многом связано с трудностями диагностики. Однако, по некоторым данным, частота венозных и артериальных тромбозов у пациентов с COVID-19 значительно выше. При этом особенности течения заболевания вызвали интерес с точки зрения поиска и изучения его вызывающих факторов и вызвали много дискуссий.

Ключевые слова: COVID-19, SARS-CoV-2, тромботические тромбоэмболические осложнения, венозные и артериальные тромбозы.

Complications of the novel coronavirus infection (COVID-19) are characterized by a wide variety of clinical manifestations. Among them, thromboembolic complications play the most important role [6,10,16]. Soon after the start of the pandemic, doctors noticed that patients infected with COVID-19 often develop various localized





thrombosis. They were mostly arterial, and in some cases venous thrombosis. It was found that the incidence of deep vein thrombosis in hospitalized patients with novel coronavirus infection can reach 79% [9,17,18]. Several changes in the coagulogram have been described in patients with COVID-19. The SARS-CoV-2 virus, in particular, causes the appearance of abnormalities such as a decrease in prothrombin time, an increase in the level of fibrinogen and D-dimer in the blood. It should be noted that the degree of deviation of these signs is directly related to the severity of the patient's condition: for example, an elevated level of D-dimer is more common in patients in intensive care units, and its average level in this category is higher than in non-resuscitated patients [5,19]. The use of anticoagulant therapy in hospitalized patients with novel coronavirus infection significantly reduced mortality [12,20]. At the same time, when assessing the time parameter of the increase in platelet activity in patients with a new coronavirus infection, an impression is made of its secondary nature in relation to the activation of plasma hemostasis. Plasma hemostasis is activated from the first days. Platelet activity increases significantly on the 9-10th day of the disease [7,21]. Activation of plasma hemostasis appears to be the main cause of coagulopathy caused by novel coronavirus infection. The SARS-CoV-2 virus causes enough tissue damage. This, in turn, leads to the activation of the immune system. As a result, tissue factor is activated. Ultimately, due to the hyperproduction of various anti-inflammatory IL-6, TNF- α cytokines, it leads to the activation of plasma hemostasis. Rotational thromboelastometry and thrombodynamic testing are used to evaluate the global processes of thrombosis formation and lysis. Using these methods, the new coronavirus infection Hypercoagulability can be determined in patients with They showed a high density and size of the thrombus, as well as a high rate of its formation [14,22].

Changes in indicators describing the state of the hemostasis system in COVID-19 and related to the severity of the disease and its prognosis, an increase in the level of D-dimer in the blood, an increase in prothrombin time, as well as an increase in thrombin and partially Activated thromboplastin time (TPT) was studied. In this case, initially, an increase in the concentration of fibrinogen can be observed. After that, the level of fibrinogen and antithrombin in the blood decreases. This condition is related to the severity of thrombocytopenia and its prognosis, and it is rarely severe. One of the factors contributing to the activation of this condition is called immunothrombosis. That is, inflammation of the blood clotting system

He was in the intensive care unit of 3 hospitals in Denmark. Of the 184 patients with COVID-19, 13 percent died. Arterial thromboembolism was the cause of death in 31% of these patients, while in the remaining patients, severe complications such as





thrombosis of deep veins, pulmonary embolism, ischemic stroke, myocardial infarction were noted. At the same time, objectively confirmed venous thromboembolic complications prevailed over arterial thrombosis. That is, pulmonary artery thromboembolism (PATE) was 27%, while arterial thrombosis was 3.7%. In a single-center retrospective study in China, the incidence of deep vein thrombosis (DVT) in critically ill patients (n=81) with COVID-19 admitted to the intensive care unit was 25%. Lille (France) intensive care unit In the analysis of 107 patients with pneumonia during COVID-19 consecutively admitted to the hospital, the incidence of ATE was 20.6%. This situation was a much higher rate compared to patients with this weight in the same period of 2019, and it was 6.1%. In autopsies, microthrombi were described in the capillary vessels of the lungs. Specific effects of viral infection, inflammation, progressive coagulopathy were considered as the main causes of these disorders [3,4,23]. In a single-center retrospective study in China, D-dimer > 1500 ng/ml level in 81 patients with severe pneumonia with COVID-19 in intensive care unit, sensitivity 85.0%, specificity 88.5 was [2,24]. Given the inadvisability of additional instrumental tests in patients with COVID-19 without indications, most experts now recommend the presence or absence of venous thromboembolic complications (TEA) in asymptomatic patients with very high D-dimer levels. they believe that screening is not necessary [1]. To assess the nature of hemostasis system disorders in patients with COVID-19, it was proposed to use two scales that are widely used in sepsis. Apparently, the first of them describes the activation of blood coagulation processes during sepsis-induced coagulopathy and still indicates a non-coagulopathy stage of the process. This scale is based on the use of anticoagulants. there is evidence that it can be used to select patients with COVID-19 who will benefit more. Thus, a retrospective review of the electronic medical records of 499 patients with severe COVID-19 who were consecutively admitted to Tongji University Hospital in Wuhan, China, identified 28 patients who received mainly prophylactic doses of heparin. Individuals with a sepsis-induced coagulopathy scale score of ≥ 4 or a significant increase in blood D-dimer levels had lower daily mortality [13,25]. The presence of disseminated intravascular coagulation syndrome (DVS) indicates the development of coagulopathy when it is necessary to replenish the missing components of the coagulation system. The occurrence of DVS is associated with a poor prognosis. Thus, among 183 patients with confirmed COVID-19 during hospitalization, DVS was recorded in 71.4% of those who died and only 0.6% of those discharged [11,20].

Thus, the SARS-CoV-2 virus causes activation of the hemostasis system at different levels. Especially from lung tissue damage, local endothelial damage can lead to





plasma hemostasis and platelet activation in the disease process. Routine use of anticoagulant therapy in hospitalized patients with novel coronavirus infection appears warranted. These questions require further research.

Summary

1. Thrombus activation and thromboembolic complications are an important element in the pathogenesis of COVID-19. Their severity is related to the severity of the manifestation of COVID-19 and its prognosis. Much remains uncertain about the prevention and treatment of TEA in COVID-19.
2. Taking into account the previously known facts about the choice of treatment methods for a particular patient, the judgment of the expert community, which is rapidly gathering information about the results of COVID-19 and their various interventions, these experiments, currently operating remains the priority of attending physicians.

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