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Euro Virology 2020: Problematic issues of pathology of a new coronavirus infection COVID-19- Vsevolod A Zinserling- Saint-Petersburg University

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Relevance of the problem of a new covid-19 coronavirus infection is obvious. Among its most important aspects that require special study, are pathogenesis and morphological changes in severe forms of the disease.

Material and methods. The analysis of 18 autopsy observations was carried out. Along with routine assessment of macro - and microscopic changes (hematoxylin-eosin, azur, PAS), immunohistochemical studies of lungs and other organs were performed using sera against antigens CD2,3,4,5,7, 20,31,34, 56,57,69

Results and discussion: In typical cases macroscopic changes were most typically found in the lower lobes of the both lungs, they appeared reddish, slightly firm without any specific hallmarks. In different cases the degree of manifestation varied.

Microscopically the lesions included several components. We considered that proliferation of ciliary epithelium and alveolocytes developed due to direct effect of the virus. We also consider to associate with viral propagation appearance of macrophages and alvelocytes of irregular form, frequently binucleated. Intranuclear inclusions were observed as well. Inflammatory infiltration was predominantly mononuclear presented mostly by CD3+, CD8+, CD2+, CD5+, CD7+ lymphocytes and numerous CD68+ macrophages, only with focal neutrophilic admixture due to bacterial superinfection. Hyaline membranes were presented in most of the cases, but their number differed critically. Very typical, especially in certain cases, were blood vessel thrombosis and hemorrhages, probably due to virus lesion of endothelium. In two cases we succeeded to detect intra and extracellular inclusions similar with typical for Chlamydia. Thus, we can suppose reactivation of this infection. Many organs (lymph nodes, spleen, intestines, brain, adrenal glands) show changes that may indicate generalization of viral infection, and infiltration of CD8+ lymphocytes in the kidneys, liver, adrenal glands, pericardium and intestines indicates a probable autoimmune component of pathogenesis. The conclusion is made about the necessity for further complex study of the pathogenesis and pathology of COVID-19.

In December 2019, a series of acute atypical respiratory disease occurred in Wuhan, China. This rapidly spread from Wuhan to other areas. It was soon discovered that a novel coronavirus was responsible. The novel coronavirus was named as the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2, 2019-nCoV) due to its high homology (~80%) to SARS-CoV, which caused acute respiratory distress syndrome (ARDS) and high mortality during 2002–2003. The outbreak of SARS-CoV-2 was considered to have originally started via a zoonotic transmission associated with the seafood market in Wuhan, China. Later it was recognized that human to human transmission played a major role in the subsequent outbreak. The disease caused by this virus was called Coronavirus disease 19 (COVID-19) and a pandemic was declared by the World Health Organization (WHO). COVID-19 has been impacting a large number of people worldwide, being reported in approximately 200 countries and territories. As of April 7th, 2020, around 1,400,000 cases worldwide have been reported according to the Center for Systems Science and Engineering (CSSE) at John Hopkins University.

SARS-CoV-2 virus primarily affects the respiratory system, although other organ systems are also involved. Lower respiratory tract infection related symptoms including fever, dry cough and dyspnea were reported in the initial case series from Wuhan, China. In addition, headache, dizziness, generalized weakness, vomiting and diarrhea were observed. It is now widely recognized that respiratory symptoms of COVID-19 are extremely heterogeneous, ranging from minimal symptoms to significant hypoxia with ARDS. In the report from Wuhan mentioned above, the time between the onset of symptoms and the development of ARDS was as short as 9 days, suggesting that the respiratory symptoms could progress rapidly. This disease could be also fatal. A growing number of patients with severe diseases have continued to succumb worldwide. Epidemiological studies have shown that mortalities are higher in elder population and the incidence is much lower in children. Current medical management is largely supportive with no targeted therapy available. Several drugs including lopinavir-ritonavir, remdesivir, hydroxychloroquine, and azithromycin have been tested in clinical trials, but none of them have been proven to be a definite therapy yet.

More therapies are being tested in clinical trials. A large number of countries have implemented social distancing and lockdown to mitigate further spread of the virus. Here we will review our current knowledge of COVID-19 and consider the underlying mechanism to explain the heterogeneous symptomatology, particularly focusing on the difference between children and adult.

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